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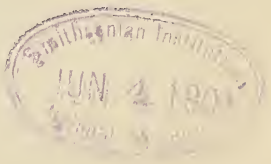
Some Sparrow Songs.

BY FREDERICK W. BATCHELDER.

The young student of bird life is usually possessed of the sweet delusion that all birds of the same species sing alike. There could be nothing farther from the truth, as he will very soon discover. The variations from the typical song in the case of such a common species as the song sparrow are almost infinite. It takes months, perhaps years, of observation to enable one to recognize this well-known bird by the song alone. I shall confess that even to this day I am occasionally thrown off the track by the little rascal's tricks of vocalization, and am not always certain of his identity until I have seen him sing.

It would be useless to attempt the transcription of the song sparrow's whole performance, even the typical one, in our clumsy notation. Very few birds sing according to our scale, except by accident. As to the song sparrow, his song consists of a pretty definite prelude of a few notes, followed by a very indefinite succession of notes forming what, for want of a better name, we call a "roulade." This is defined by Moore, in Webster's Dictionary, as "a passage of running tones ; especially a running flight of notes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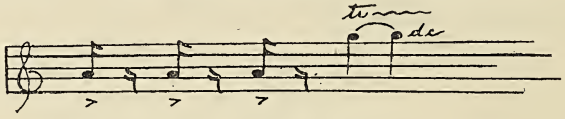
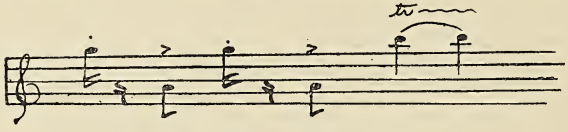
extemporaneously introduced as an embellishment." If our former honored citizen, Mr. Moore, had studied the song sparrow's performances for the special purpose of perfecting his definition, it could not have better fitted this particular case. The notes of the prelude, being given with deliberation and definite emphasis, may be fairly well represented. What may be called the typical form is this:



spink—spink—spink—kre-e-e- - - etc.

Frequently the number of introductory notes is more or less than three, and only yesterday I heard a song, many times repeated, in which they were omitted altogether.

Another interesting variation is the following, often given by a sparrow who nests in our grounds and who more commonly sings the typical song noted above:



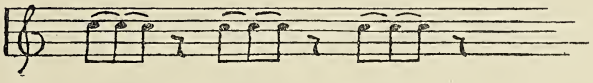
tick — too — tick — too — kre-e-e- - - etc.

This form is used apparently when the bird is bubbling over with high spirits and feels that his usual song is insufficient to express his sentiments.

It would scarcely seem that the chipping sparrow's song, that "dry, tuneless trill," so monotonous, yet so cheerful, could be susceptible of variation. Yet it does actually vary in quality. The pine warbler has a song so much like chippie's that it takes a practiced ear to distinguish the two, even when both are given with typical intonation. But some chippies have better voices than others, and

some pine warblers poorer voices, so that it is sometimes impossible even for an expert to tell which is singing unless he sees the bird. The artistic chipping sparrow imparts some of that liquid, resonant quality to his tones which is characteristic of the typical song of the pine warbler, and vice versa.

A very singular variation in the form of the chipping sparrow's song was observed two years ago in an individual who nested in an adjacent lot. The song was for some time a puzzle. It was about nesting time when we first heard it, and the bird was very shy. Supposing him to be of some species hitherto unknown to us, we followed him up cautiously and discovered that he was our old friend chippie after all. His song, instead of being uninterrupted, was every time broken into three parts of about equal length, just about like the telephone call No. 3, when the operator is getting out of patience and gives long strokes:

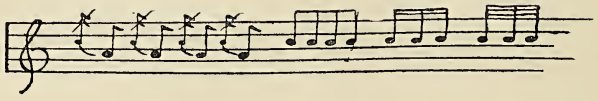


tre-e-e tre-e-e tre-e-e

This is the only variation in form that I have yet noted in the song of this species.

One of the sweetest and simplest of sparrow songs is that of chippie's near relative—Burroughs calls him his country cousin—the field sparrow. He is not so social as chippie and usually keeps a little way out of town. His song is a most beautiful succession of liquid tones at nearly the same pitch. It is what chippie's song might be if he were to study the Italian method and learn to "place his tones," as the cant musical phrase goes! He also has an introduction. It consists of four or more most persuasive, tender, heart-touching tones. This is followed by a monoto-

nous but exceedingly sweet repetition of the syllable "de-de-de-de:"

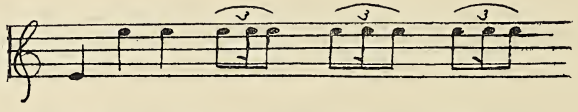


tee-oo, tee-oo, tee-oo, tee-oo, de-de-de-de, etc.

The first four notes are given slowly and the subsequent monotone more and more rapidly till the close, where sometimes a few very sweet whistles are sounded as a finish.

The song of the vesper sparrow defies transcription. Two introductory tones, very much like those of the field sparrow in form but of different quality, are followed by a roulade of wonderful sweetness, richness and brilliancy, far superior to that of the song sparrow.

Two passing sparrows are with us at this moment (May 17), the white-throated sparrow or peabody bird and the white-crowned sparrow. The latter species, while always here in the migrating season, comes in such small numbers as to be known by few. The song of the white-throat is one of the few which happens to conform to the requirements of our scale. This is a typical song:

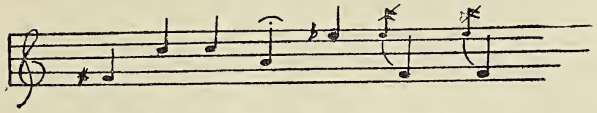


Sow wheat here, peabody, peabody, peabody.

I give the traditional setting of words; not a very poetical one, but serving admirably to give the rhythm of the song.

The usual song of the white-crown is a sort of sad ver-

sion of that of the white-throat. As I have heard it, it may be represented as follows:



O dear me! pee—pyu—pyu

This is sung very slowly and the second half with a curious intonation, suggesting memories of "mal de mer." I have only once heard the full song of the white-crowned sparrow. It is superb in form and quality, more nearly resembling that of the vesper sparrow than any other. Like that it defies transcription.

Limestone and Bog Iron Ore Near Manchester

The Archæan Rocks of New Hampshire do not contain much limestone, but in a few places it is found, showing that there were a few hollows in the Laurentian ocean bottom in which the animals of that time left their skeletons. In the northeast corner of Amherst, in a small valley through which trickles a tiny brook, is found a small outcropping of carbonate of lime. It was briefly described by Dr. Jackson in his early work on the Geology of New Hampshire For a while it was quarried and burned but was finally abandoned and is now largely covered with soil and rocks that have been dumped into the excavation. The limestone is so crystalline that probably no fossils could be found in it.

A few miles northeast of the limestone deposit, in the town of Bedford, is a small deposit of bog iron ore which is of fine quality but not very extensive. This is said to have been worked some in the past.

Odd Members of the Fish Family.

BY MARY HAZEN ARNOLD.

In a little village by the sea, where we spent a happy summer, lives Captain Jedediah Mack—"Uncle Jed," he is called by old and young. He is a grizzled old sea captain, eighty years "young," and has beguiled away many pleasant hours with his fish stories and tales of adventure. He has tiny gold rings in his ears, tattooed arms and a wooden leg, and his bronzed face wore its most benign expression when he was surrounded by a group of children listening in open-mouthed wonder to his yarns of many thrilling escapades at sea, and though possibly at times he might "draw upon his imagination for facts," his *true* wonder tales were more marvelous that any imaginary tales of Sinbad, the Sailor.

Thus I found him one day last week, whittling out miniature boats for a trio of grandchildren clustered about him, in his tiny cottage on a bluff overlooking his beloved ocean.

I wish space permitted a description of the interior of Uncle Jed's home, with its heterogeneous decorations—harpoons, curious shells, corals, sea mosses, oddly carved boxes, rare bits of tapestry from foreign shores, charms, idols, and—the pride of Uncle Jed's heart—a perfect model of the good ship "Mary Ann," complete from bow to stern. Over all hovered a distinct aroma of tar and other ship flavors, which was like incense to the old man's nostrils. The atmosphere and surroundings gave an added charm to the sailor's stories, and I wish I could reproduce for you his quaint language.

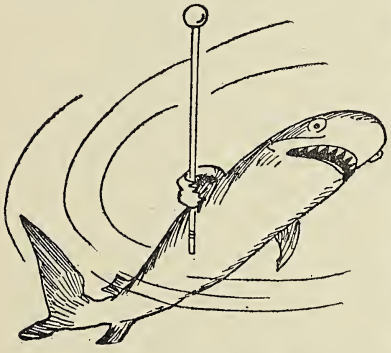
I questioned him in regard to some strange fish of which I had recently learned, and as soon as he had launched forth on his favorite theme, I had but to listen.

"Well," said he, "there are 1300 different species of fishes, and among them there are some pretty curious ones.

Did I ever tell you about my trip 70 fathoms beneath the sea?" Settling back in his chair, and taking a child upon each knee, Uncle Jed began his story.

"It was in the fall of 1870, when off the Canaries on my return from an extended voyage, that I decided to take a little submarine trip for a change. So, borrowing a diver's suit from Caleb West, I started on as novel a journey as I have ever taken. The old ocean gave me a roaring welcome. Down, down, into the depths I dropped, and rested at last on the sea bottom, diversified by its plains and mountains, great valleys and precipices, and their marvelous, innumerable inhabitants.

"Whether or no fishes are able to intercept messages on the cable I cannot tell, but in some manner they had received notice of my visit and formed a grand naval parade in my honor. A large shark, 36 feet long, seemed master of ceremonies, and, opening his mouth to the width of six feet, showing six rows of triangular teeth which he moved at will by the powerful muscles at their bases, he turned his small green eyes toward me and smiled. I knew he loved me dearly, but I did not care for a closer acquaintance. Attached to the shark was a tiny fish with a name longer than itself—Echines remora. It had a flat disk covering its head, by which it was so firmly attached to the flank of the shark that a man's strength would not have sufficed to separate them. It had in this manner made a long voyage without fatigue.

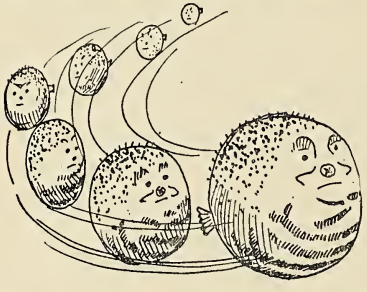


"As I looked down at my feet I thought I had at last discovered Captain Kidd's treasure, but a closer examina-

tion showed that what I took to be a box was but another remarkable denizen of that nether world. It was a coffer fish, so called from the bone compartments joined one to another, so that its body is encased in a kind of box or coffer, showing only its fins and tail. This one was triangular in shape; some that I afterwards saw were quadrangular.

"On a bank at one side lay the reporters, the most conspicuous one being a large cuttle-fish, who frequently threw out a voluminous jet of ink, coloring the water all about him. Later on, I secured some of this fluid, and my daughter now uses it in her successful sepia work. This sepia is of indestructible color and apparently only used by the cuttle-fish as a means of defense.

"But soon I had no leisure to notice outside attractions; the great parade was at hand. A company of globe or moon fish led the procession. These curious fishes, about two feet long, have no distinct teeth, but their jaws, shaped like a parrot's beak, are covered with a substance like ivory, formed of the teeth consolidated, which is reproduced as worn away. They inflated their bodies by filling their stomachs with air, thus assuming a globular form. Spines stood out in all directions like those of a hedgehog when rolled up; hence they are sometimes called porcupine fish. As it was now quite dark, these globe-fish shone brightly with a phosphorescent light, the rays rendered undulating by the rippling water, suggesting the idea of dancing stars.



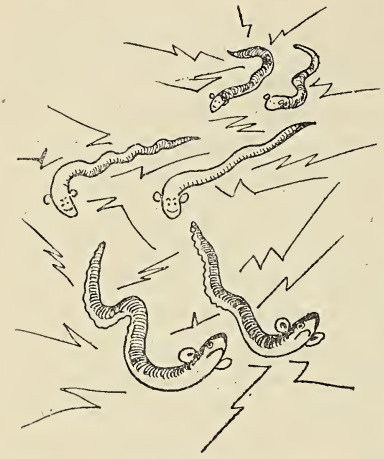
"Up and down the line rode the cavalry, winged steeds of the sea. These sea horses were about four inches long, blue in color, and their blue eyes seemed to move inde-

pendently of each other. Their heads were singularly like that of a horse, and they swam in an upright posture, their tails seizing hold of whatever they chanced to meet in the water.

"I next noticed a large company of fish in bright, beautiful array; prominent among them were the mullets. These wore bright red coats with clear white vests. One of them met with a fatal accident by the way, and as it expired turned successively to purple, violet, blue, and at last to palest white. The sea parrot was another fish decked in the most lively colors, the yellow, green, blue and red forming bands of spots which shone with a metalic luster. With these was also a large company of balistes, who gamboled about like children, producing curious combinations of color. Another member of this division of the parade was the stickleback, a small fish of beautiful colors. It is particularly interesting because of its nest building. It collects small pieces of sticks and straw with which the bottom of the nest is laid among the water plants, and these they cement together by an exudation from their own bodies. Last of all in this gay company was the opah, or king-fish, a large oval fish with the most gorgeous colors. Before I had time to note more of this division, they had swept by me with a swish, swash.

"While still dazzled with this array of beauty, I was roused by a sharp shock, and for fifteen minutes or more my hand and arm were deprived of all sensation. The

electrical fishes were passing, and an electric eel had stepped out of line and given me a slight handshake. Fortunately for me, the fish was a small one, for had it been



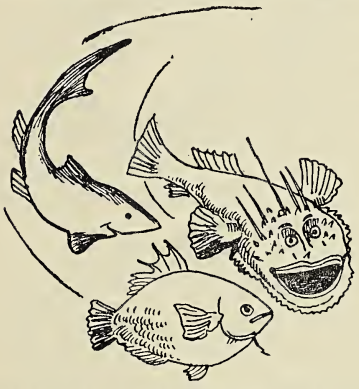
like some others in the procession—three or four feet long—I should have been thrown down by the shock. The electric eel is larger and stronger than any other electrical fish. I wished for the presence of our wizard, Edison, for here were all sorts of electrical fish. There was the cramp-fish, with its round flattened body of reddish brown color with eye-like spots of dark blue in the center. It carries an apparatus shaped like a half-moon placed on each side of the mouth of the respiratory organs, which produces violent electric shocks to any one so careless as to touch it.

"Next on the program came various kinds of flying fish, with fins nearly the length of their bodies, acting as parachutes rather than wings. They swam in shoals, from 12 to 100 in number, and often left the water together, darting through the air in the same direction, usually going but two or three feet above the surface, returning into the water at a distance of 200 yards from where they rose, but

occasionally they spring so high that they land upon the decks of ships. Some of the company did not return to us after their aerial flight, having fallen victims to the large sea birds ever on the watch for them. These fish had dazzling silvery backs with blue heads and sides.

"The flying gunard, with its head in a coat of mail, with horrible spines with trenchant blades of a beautiful rose color, also has fins of great size and sometimes flies 40 yards above the water's surface. Many times, when I have been sailing on the Mediterranean, in rough weather at night I have seen numbers of gunards by the phosphoric light they emit, making their arched passage in apparent streams of fire.

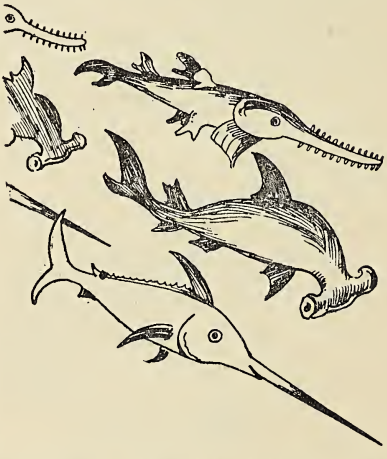
"But to return to the naval parade. Another division quickly passed. This contained some of the sportsmen of the sea. Here was the angler, or fishing frog. Not a beauty, he is sometimes called, for his ugliness and voracity, the sea devil. This fisherman was about four feet long, with an enormous head and a mouth containing many sharp, curved teeth. By means of wormlike appendages about the mouth and by filaments which rise from the upper part of the head, it attracts small fishes upon which it seizes and feeds.



"Another sporting fish was the archer fish. He has the faculty of projecting drops of water with sure aim at insects, thereby causing them to fall into the water, where they are instantly seized as prey. They are six or seven inches long, and project a drop of water to the height of four or five feet.

"A hideous great dog-fish, four feet long, came trotting after these sportsmen. This fish is very voracious, and often attacks men. Its flesh is hard and smells of musk. This case which holds my spectacles is made from the skin of that identical dog-fish, which I afterwards captured. The skin is called 'shagreen,' and as you see is of a green color and takes a high polish.

" Next came two very odd specimens. They had come from Australia and India to join the pageant in my honor. One was the lung-fish, which has not only gills, but a bladder by which it breathes air, and makes a sound like the barking of a dog. The streams in which it lives are dry during a part of the year, and it then buries itself in the mud till awakened by the warm rains. It is six feet long, and sometimes crawls over marshy places by means of its gills. Another kind of lung-fish envelopes itself in a clay sack or cone during the dry season. The other fish was the climbing perch, which, by the peculiar structure of some of the membranes of the head, retains water sufficient to keep the gills moist and so enables the fish to remain out of water for some time. It can climb banks and even trees, by means of strong muscles of the spines.



" Then appeared a company of artisans. A hammer-head fish, with its singular hammer shaped head, passed by me, his golden colored eyes in one end of the hammer became the color of flame, giving him a horrible appearance. Then a saw-fish, with its snout elongated into a flat,

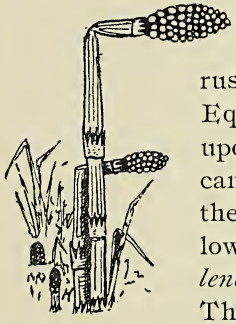
long saw, armed on each edge with about 20 long teeth, a most formidable weapon. And a sword-fish, with its upper jaw elongated and compressed into the form of a sword or dagger. And—''

Here Uncle Jed was interupted by the arrival of the 'bus which was to take me to the station. ''Why!'' he exclaimed, ''I have hardly made a beginning of my tale. Well you must come down again and I will tell you of many other fish as strange as these.''

This I gladly promised to do, and as the train bore me rapidly back to the city, I thought upon the marvels to which I had listened, more than ever convinced that ''truth is stranger than fiction,'' and congratulating myself upon having heard that afternoon, a *really true fish story*.

Some Fairy Kickers.

BY WILLIAM H. HUSE.



FROM about the first of May till midsummer the various species of scouring rushes or horse-tails, known to botanists as Equiseta, will fruit and scatter their spores upon the wind. No more amusing sight can be found in the vegetable world than these spores under a microscope of even low power. They are kickers *par excellence* and, like all such, provoke mirth. The fertile stems of the Equisetum arvense are the earliest to appear and are the most abundant near Manchester. The light brown, fertile stems with encircling, pointed sheaths, bear cone-like spikes composed of little scales that fit tightly together until the enclosed spores are mature. Each little globular spore has four filaments attached that are tightly wound about it until the spore is ripe and dry. Then they suddenly straighten

with a force sufficient to throw the spore some distance. As usual, it is the kicker that is kicked.

The proper time to collect a plant and see the fun is when the fruiting heads are beginning to ripen and a portion of the spores are falling out. It will then be all ready for inspection by the time you get home. Focus your microscope and, with your eye at the eye-piece, shake the spores upon the slide. Such a kicking and scrambling you have not seen since the last Rugby game in the fall. When the legs are all straight and everything is quiet, breathe gently upon the spores. If the microscope be small, you can do this without taking the eye from the instrument. As the mass is moistened the filaments bend and again are bound about the spores. In a few seconds they again become dry and another contest begins.

Nothing in the plant world of New England is so provocative of merriment as these little fairy kickers. Nature must have been in a merry mood as well as prudential when she invented them. For an evening at home they are a perfectly proper ballet. In the school room they are a fertile source of interest and pleasure. In connection with the observation read W. H. Gibson's chapter on squirming spores in his "Sharp Eyes."

How to Find the Constellations. XI.

BY GEORGE I. HOPKINS.

The lengthening of the duration of daylight at this season of the year renders it impossible to continue our observations at the usual hou r, and, as the June moon is at its full phase on the second day, it will again interfere somewhat with our observations. It is doubtful if a good view can be obtained before half past eight, so we will take our station at that hour.

Let the observer face the south and he cannot fail to notice a star of the first magnitude just a little east of the meridian, at an altitude of nearly forty degrees. This is the brightest star in the constellation Virgo, the Virgin, and is named Spica. This is one of the zodiacal constellations, and comprises a large area, being about thirty degrees wide by forty degrees long. The meridian at this time passes very nearly through its center, so that it extends about twenty degrees each side of the meridian. It occupies all the space below Coma Berenecis and Bootes, which can now readily be located by the star Arcturus about ten or fifteen degrees east of the meridian, for about twenty degrees. It comprises one hundred and ten stars Spica alone being of the first magnitude. Of the others only six are of the third and ten of the fourth magnitude, so that unusual atmospheric conditions are necessary to appreciate the magnificence of this group. On pictorial star maps Virgo is represented by a woman in a reclining position holding in her left hand an ear of corn or a sheaf of wheat which is located by the star Spica, and in her right a pair of scales.

"Her lovely tresses glow with starry light;
Stars ornament the bracelet on her hand;
Her vest in ample fold, glitters with stars;
Beneath her showy feet they shine; her eyes
Lighten, all glorious with the heavenly rays,
But first the star that crowns the golden sheaf.

According to the ancient poets this constellation repre-

sents the Virgin Astræa, the Goddess of Justice, who lived upon the earth during the golden age; but being offended at the wickedness and impiety of mankind during the brazen and iron ages of the world, she returned to heaven, and was placed among the constellations of the zodiac, with a pair of scales in one hand and a sword in the other.

Immediately below Virgo and occupying a space about fifteen degrees in width is the tail of Hydra which runs along westward nearly parallel with the horizon for a distance of more than ninety degrees, with its head just below Cancer, away in the west. The rest of the space between Hydra and the horizon is occupied by a portion of the constellation Centaurus, very little of which can ordinarily be seen in this latitude. It is of interest mainly because its brightest star, Alpha, is the nearest of the fixed stars to the earth, the light occupying about four years to come from the star to the earth.

Directing the gaze now to the east, the observer can readily discern the red star, Antares, recently risen, which, it will be remembered, is the brightest star in the constellation Scorpio, which was located a year ago, then in the southwest. Between Virgo and Scorpio is a region of faint stars only two of which are of the second magnitude and two of the third. This is the constellation Libra, the scales which, as was mentioned above, the Virgin holds in her right hand. This also is one of the zodiacal constellations and contains in all, fifty-one stars. Although this is the last of the zodiacal group to be mentioned, it is the seventh in order beginning with Aries, or the eighth beginning at the vernal equinox. At the time when the constellations of the zodiac and the signs of the same name coincided, about 2200 years ago, the sun entered Libra at the Autumnal equinox, Sept. 20. Since at that time the days and nights are of equal length all over the world, the scales or balance has been used by all nations as emblematical of that

fact. Some assert, however, that the beam only of the balance was at first placed among the stars, and that the Egyptians thus honored it as their Nilometer, or instrument by which they measured the inundations of the Nile. According to Virgil the ancient husbandmen were wont to regard this sign as indicating the proper time for sowing their winter grain :—

> "But when Astræa's balance, hung on high,
> Betwixt the nights and days divides the sky,
> Then yoke your oxen, sow your winter grain,
> Till cold December comes with driving rain."

Below Corona Borealis the observer can doubtless readily recognize the constellation Hercules, which, when located, appeared in the West. Below Hercules and Libra is a large region of low magnitude stars, extending from Scorpio to Aquila. This is the constellation Ophiuchus, or Serpentarius, the serpent bearer. It contains seventy-four stars, only one of which is of the second magnitude. It is also sometimes called Æsculapius, the god of medicine. About half way from the Northern Crown to the horizon, right in the upper edge of the Milky Way, is a group of small stars, comprising a part of Ophiuchus, resembing very much the Hyades in Taurus, only very much smaller. This is called Taurus Poniatoroskii. This little group is interesting mainly because of its position in the heavens. It is situated almost exactly on the celestial equator, and is, therefore, nearly equidistant from the two celestial poles, and, like Orion, is visible to the entire habitable world. The solstitial colure also passes very near it, and it is, consequently, very nearly midway between the vernal and autumnal equinoxes. This is one of the constellations, being known 1200 years before the Christian era. Homer mentions it, as well as Manilius.

> "Next, Ophiuchus strides the mighty snake,
> Untwists his winding folds, and smooths his back,
> Extends his bulk, and o'er the slippery scale,
> His wide-stretched hands on either side prevail."

Æsculapius was the son of Apollo, and was educated by

Chiron, the Centaur, in the art of medicine, in which he became so skillful that he was considered the inventor and god of medicine. He accompanied the Argonauts to Colchis in the capacity of a physician. He is said to have restored many to life, insomuch that Pluto complained to Jupiter that his dark dominion was in danger of being depopulated by his art. Æsculapius was worshipped at Epidaurus, and hence is styled by Milton "the god in Epidaurus." Being sent for to Rome in time of a plague, he assumed the form of a serpent and accompanied the ambassadors, but, though thus changed, he was Æsculapius still, and under that form continued to be worshipped at Rome. The cock and serpent were sacred to him, and one of the last acts of Socrates, who is accounted one of the wisest and best men of pagan antiquity, was to offer a cock to Æsculapius.

> "Hail! great physician of the world, all hail!
> Hail! mighty infant, who in years to come,
> Shall heal the nations and defraud the tomb"

This completes the list of the prominent constellations visible in the latitude of Manchester. The remaining ones are small and unimportant, and are unrecognized by some authors. They are also, for the most part, difficult of location, and so it has not been considered worth while to attempt it. If any one desires to, however, a good star map will be of more service than these pages. As the constellations first located are now coming again into view, the previous numbers can be used again to confirm or rectify according to the observer's need.

With May Torreya reached the fifth number of its first volume, fully sustaining the confident expectation of the many friends of the Torrey Botanical Club, for which organization it is edited by Marshall Avery Howe of the New York Botanical Gardens. Subscription, $1 per annum; remittances to be addressed to Dr. H. B. Ferguson, 41 North Queen St., Lancaster, Pa.

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Among the Dragonflies.

BY EDWARD J. BURNHAM.

To most people the Dragonfly is an object of aversion, if not of dread. In this, as in many other matters, the traditions and prejudices of the past weigh more heavily than we are apt to admit upon the boys and girls and men and women of today. Dragonfly, Devil's darning-needle, Adderfly, Snake Doctor, Horse-stinger are words of evil import. These harmless creatures have been given a bad reputation, and through the years, with all their grace of motion, beauty of color and service to man they have been unable to live it down. Some few peoples have dealt more kindly with the Dragonfly. In Germany it is the Water Maiden (*Wassernympfe*, *Wasserjungfer*); in France it is the Damselfly (*Demoiselle*); in Denmark, the Goldsmith (*Goldsmed*); but in Holland it is the sharp-sticking-fly (*Scherpstekendevlieg*); in Portugal, the fly with the great stings (*Mosca que da grandes picadas*); in Italy it is the Arrow (*Saetta*); and in Sweden it is *Trollslanda*, suggestive of hobgoblins and weird scenes in the deep wood at nighttime.

It follows that the Dragonflies, although differing great-

ly among themselves in size, in pattern of color, in structure and in habits, have no distinctive common names. It has been thought to be enough to fling some term of dread or disrespect at the group as a whole, and then shun the individuals. The scientists, whose tender mercies in the matter of nomenclature are often cruel, have dealt more gently than is their wont with the Dragonflies, and such names as Libellula pulchella, Plathemis trimaculata and Nannothemis bella are not disagreeable, although unfamiliar to most English ears. Some day, when the study of nature has brought us to a better understanding of these active creatures and to a fuller appreciation of their service in the destruction of mosquitoes and other insect pests, we may come to think it worth while to give them some attention. We may then expect books with carefully prepared plates showing their grace of form and wealth of color, making it easy to recognize them at rest or on the wing, and to call them by their names, as has already been done by the birds and many of the butterflies. For the present, however, when telling about them in popular language, we may speak of them only as Dragonflies, leaving the somewhat forbidding scientific names to the few who have taken the trouble to learn them.

Away up in New Hampshire there is a brook, which, as often happens, is loved most by those who know it best. For part of its course it flows at the base of a bluff which marks the end of the work of the waters in the far-off glacial time, when they laid down the great sand plain that stretches away to the northward. The bluff is covered with pines, and below, at the foot of a stretch of rapids, are quiet pools. Along the banks the willows blossom in the springtime and lead the long procession of the flowers. On the bluff, in their season, nod the Twin-flower and the Lady's-slipper, while below Verbena hastata mingles in profusion with the Snap-dragon and the Joe-pye weed, the lat-

ter often bearing the twining Dodder, which, trusting to its chosen support, has severed all connection with its mother, the earth. Some have harshly termed the Dodder a parasite, but they may be wrong. Certainly the Joe-pye that supports the clinging vine stands as stoutly and makes as brave a show as his fellow that stands alone. Perhaps, in some mysterious way, the twining, clinging Dodder is a help. Who knows?

In August the Cardinal-flowers fill in a border of color on either bank, and later the trees in the valley show the change of hue which spreads slowly on either hand until the hillsides are resplendent in crimson and gold. Then, as winter approaches, kindly Nature covers the stream with a sheet of ice, to which she later adds a thick blanket of snow. The brook murmurs a little, like a child when sent to rest, but bides its time till the return of spring, when it throws off its covering, and the willow catkins wave their greeting, while the ceaseless round of the year rolls on and the pageant of the summer begins again.

There is one scene in the miracle-play presented here which might be entitled, "Mayflies, Dragonflies and Birds; or the Survival of the Fittest." A year is required for the preparation, and although the performance may be postponed on account of the weather, this scene is never cut for lack of an audience. Indeed, the smaller the house the better the play is apt to be. This year, on June 3, a visit was made to the pines on the bluff to learn what might be going forward, and many glimpses were caught of what could literally be styled an undress rehearsal. The Mayflies and Dragonflies, which had lived their year out in the nymph state in the broad, still pools at the foot of the rapids, were coming forth as if moved by a common impulse.

The Dragonfly nymphs, when their time comes, crawl out of the water, cling to some rush or twig and wait until the hard covering of their bodies dries and cracks open

down the back. Then they slowly work themselves out, flimsy and feeble enough at first, with need of patience for several hours more while their bodies harden and their wings expand. The Mayflies have even more to do before they are ready for the last great business of their brief lives out of water. They leave their nymph shells to float down the stream—the fishes may have them now if they want them—while they themselves fly up to the pines. They have now their wings, feet, antennæ and caudal setæ all complete, but are still too heavily clothed for their new ways of life; so they proceed to remove all superflous attire, drawing themselves slowly from the outer skin that covers the entire insect. They are then the most gauze-like of all the creatures of the air, veritable sprites, and ready, on the next bright day, to choose their partners for what is, to many of them, a dance of death. There were many of the Dragonflies, still soft-bodied and weak, clinging to the greenish-yellow shoots of the pines, and there were many Mayflies undergoing their last transformation. Everything was in readiness for the production of the tragedy; evidently there would be stirring times on the morrow.

We were a little late, the Boy and I, on June 4, and the play had already begun. It would have gone on if we had not come at all; it was not for our benefit anyway. There is a sort of small amphitheater near the crest of the bluff, where small pines stand densely in the arc of a circle, with an open space before them. The sun shone in warm and bright, and there, in the sunshine, were the Mayflies dancing, as if in delirium of ecstacy, while the Dragonflies, ever and anon, darted among them, always seizing a victim to be eaten at leisure while resting on the twigs of the pines. It was a plain case of color protection for the Dragonflies—the yellow stripes and spots and bands of their gaily colored bodies blending with the greenish-yellow of

the new growth of the young pine trees. But the Dragonflies were not so safe when on the wing. Again and again a shadow would fall, straight as an arrow, from the tree-tops, and a Kingbird or other Flycatcher would rise with a victim in his mouth. Soon after, the bright wings of the Dragonfly would be seen falling, shimmering, through the branches of the trees. It was all a tragedy, but such a tragedy as was worth going many miles to see.

"There must be thousands of Mayflies and hundreds of Dragonflies," said the Conservative Observer. "Millions and thousands!" exclaimed the Boy, as he hurried on, brandishing his net, but only to check himself a moment later, his naturalist's instinct having suggested that he might spoil the show if he came on the stage before getting his cue. He did, however, take in his net a fine specimen of Macromia illinoiensis (it has no English name) which had just seized a Mayfly. He held it by the wings while it went on eating its victim as calmly as if death were not staring it also in the face. Slowly the Mayfly was taken in, head foremost, until only the caudal bristles remained outside, and these, too, finally disappeared. Then the Boy released the Dragonfly, but it was a short reprieve, for a Kingbird pounced upon him as he flew away, and soon after his gauzy wings came falling slowly from a tree-top. The Kingbird, if he knew, when he had appropriated the Mayfly and the Dragonfly, one within the other, might have felt somewhat like the mate of the Nancy brig.

There were four Kingbirds and several other representatives of the Flycatcher family which shared greedily in this Feast of the Dragonflies, and the shining wings fell thickly for a time. Then the curtain came down upon the tragedy. The Mayflies ceased to dance; the Dragonflies sought the shelter of the twigs, and the birds flew away to look for victims elsewhere. The shadow of a large pine had covered the amphitheater, and all was still. The Boy

sat upon the front of the bluff that overlooked his favorite brook, reckoning his score. Of the Dragonflies there were eight genera and eleven species—but not one of them had an English name.

Songs of the True Thrushes.

BY FREDERICK W. BATCHELDER.

The true thrushes of America were formerly included in the genus Turdus with the thrushes of the old world. Recently they have been separated as the genus Hylocichla. Of this genus there may be seen in New Hampshire either as residents or migrants five species and one subspecies, as follows:

Hylocichla mustelina,	Wood Thrush.
" fuscescens,	Tawny Thrush.
" aliciæ,	Gray-cheeked Thrush.
" " Bicknelli,	Bicknell's Thrush.
" ustulata Swainsonii,	Olive-backed Thrush.
" aonalaschkæ pallasii,	Hermit Thrush.

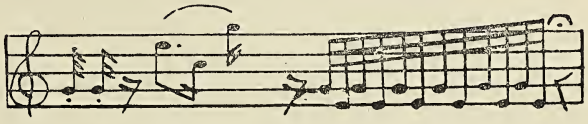
The Tawny Thrush is also called Wilson's Thrush or the Veery; the Gray-cheeked is sometimes called Alice's and the Olive-backed, Swainson's Thrush.

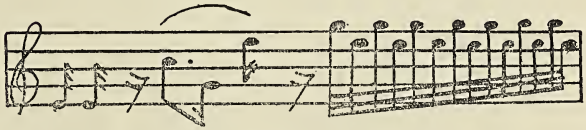
The Gray-cheeked Thrush breeds in the far north and is accordingly with us only in migration. Its subspecies, Bicknell's Thrush, breeds in the White Mountain region. The Olive-backed Thrush breeds in the same region, but probably has a more southerly range and may be a summer resident in the vicinity of Manchester. The Wood, the Tawny and the Hermit Thrushes are common summer residents with us.

It has been my good fortune this season to see all these thrushes except Bicknell's and to hear the songs of all ex-

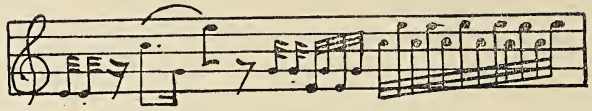
cept that and the Gray-cheeked Thrush. The Wood Thrush may be heard from about May 12 to July in almost any deep wood or well watered grove. A pair nested this year in the north-eastern part of the city in an oak grove adjoining occupied lots. The male is a fine singer and I have many times listened to him from a distance of 150 ft. This proximity has revealed many tones I never before heard. In the far distance only the three principal tones are audible, and those have been very well represented by the words, "come to me." At short range the song becomes quite a different thing. The principal notes are introduced and followed by calls, trills and tremolos, some of them not altogether musical. I give seven different forms of the song which were transcribed on the spot. These were all repeated many times but apparently with no definite order of succession. Between the phrases there was rest of from 10 to 20 seconds.

No. 1.

No. 2.

kuk - kuk - come to me.

No. 3.

kuk - kuk - come to me.

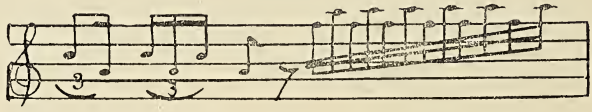
No. 4.



kuk - kuk-come to me - kuk - kuk.

No. 5.

Occasionally there would be a decided change of key, as if after singing in the key of C the bird had changed to that of F, like this:

No. 6.

No. 7.

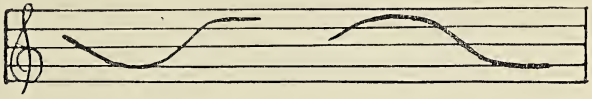
The syllables "kuk kuk" are intended to represent certain dry, unmusical tones which are frequently uttered before and between the strictly musical parts of the songs. The tremolo of 32d notes is a rich, resonant, gurgling alternation of consonant tones at such a rapid rate that the effect of a sustained consonance is produced. No doubt the echoes are largely concerned in the "tout ensemble."

It must be borne in mind that these transcriptions and those which follow are but attempts, and very unsatisfactory ones, to reproduce in our notation, songs which can

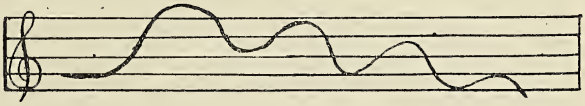
by no possibility be made to conform to the requirements of our clumsy scale. They are merely suggestive.

The form of the song differs materially in the different species. The forms characteristic of the four species under consideration may be fairly well represented by curved lines placed upon the staff so as to indicate the rise and fall in pitch, as follows:

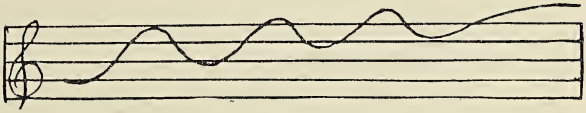
Wood Thrush



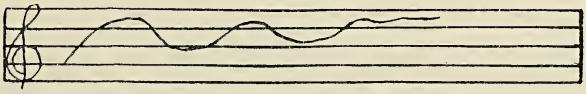
Veery.



Hermit.



Olive-Back.

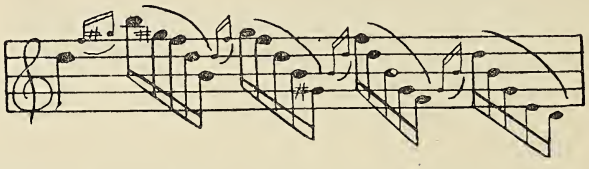


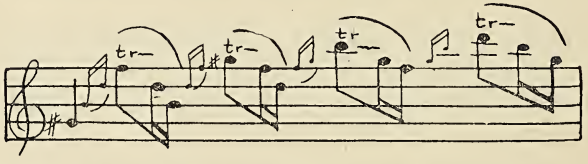
In the same grove with the Wood Thrush several pairs of Veeries are nesting. Individuals vary greatly in quality of voice and in pitch and length of song. One to which I listened yesterday had the song in its simplest form. Possibly he was young and his voice not yet fully developed. The successive arpeggios usually drop a little in pitch, but his remained the same, like this:

Veery.

The first note is a low, soft whistle, which cannot be heard unless one is quite near the singer. The notes of the broken chords melt into each other in such a way that here also the effect of sustained harmony is produced.

Another singer, older or more gifted, gave the song with a wider sweep and greater elaboration, like this:

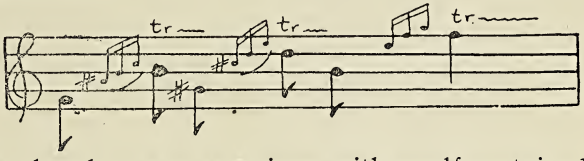
Veery.

To my sincere regret I have been unable this season to hear the song of the Hermit Thrush except at such a great distance as to miss all but the principal tones. Nevertheless I will endeavor to recall it from memory as I heard it two years ago. It will be observed that the curve of his song winds upward, instead of downward like that of the Veery. It is also delivered with greater deliberation.

Hermit Thrush.

Two years ago I heard for the first time the song of the Olive-backed Thrush. A pair remained on our grounds from May 25 to June 2, and the male sang frequently.

This year the Olive backs were very numerous and sang freely from May 28 to June 3. The song is in form much like the first part of the Hermit's, but is different in quality from that as well as from the songs of the Veery and Wood Thrush. It possesses a beautiful vibrating quality, sweet and penetrating, which pervades every tone and imparts a rare musical "color" which cannot be well described.

To my ear it is the most delicate and refined of all thrush songs I have yet heard. In the distance one is reminded of the first phrase of Handel's song, "O had I Jubal's lyre." At short range a succession of trills and turns is revealed, something like this:

Olive-back.



All of the thrush songs are given with a self-contained deliberation which is admirable and contrasts strongly with the hurried, restless phrases of the more common singers. In pitch they vary greatly, ranging from one octave higher than that indicated by the notes in the above transcriptions to two octaves higher.

In quality they far excel all other bird songs and may be truly pronounced the finest music on earth.

Toadstool Signatures.

BY ALBERT L. CLOUGH.

The toadstool is a plant attractive by its weird and unusual habits of growth and by its almost endless variety of form and color. It is hardly strange that a mass of legend and superstition has attached to it the world over. Its sudden and prolific occurrence and equally sudden and mysterious disappearance seem like the result of botanical conjuring rather than the orderly processes of Nature.

We know, of course, that the toadstools as we see them are the fruit of a minute and generally unnoticed plant which grows underground or in the substance of decaying wood or other organic matter. This fungous plant is almost microscopic except when seen en masse, when it appears like a white, cottony cobweb spreading through the earth, where it is obtaining the nutriment which is to appear in

the prodigious growths of mushrooms upon the surface. When viewed under the microscope, this mycelium or true mushroom plant is seen to lose its cobweb structure and to resolve itself into tiny, interlaced filaments or threads, which meander about in the most bewildering manner through the mass of the earth or wood in which it grows. The filaments which form this true fungous plant are seen to be made up of separate cells, the addition of which constitutes the growth of the plant.

When a mushroom or toadstool (for these terms are used synonymously) is pulled from the ground and carries with it a little of the soil, the mycelium may usually be found in it, and it will repay careful examination under a compound microscope. Someone has likened the underground mushroom plant and its mushrooms to an apple-tree which bears its fruit upon its topmost branches, and which is imagined to have been sunk in the ground until only the fruit is visible.

Among the unique accomplishments of the mushroom is that of subscribing its own signature when it is given a good chance. If it cannot write, it can certainly make its mark. And its mark is characteristic of its own species and forms a ready help in correctly placing it among its numerous relatives. M. Berthillon, the French criminologist, recognizes his man by the characteristic print of his thumb in wax. The mycologist recognizes his specimen largely by the print or image of its under surface traced by the falling of its own spores. Fortunately, the vast majority of toadstools are the friends and not the enemies of society. The under surface of the ordinary mushroom or toadstool is supplied with a delicate and beautiful system of membranous plates, which are called the gills or lamellæ. They are placed vertically on edge and radiate from a common center—the stem—to the outer edge of the cap. Upon them are produced and matured, as the plant ripens,

the minute spores or reproductive bodies, which fall in due season and are wafted away by the wind, floated upon the water or carried by animals to points where favorable conditions exist, where a few of them find lodgment and produce a new mycelium, which in time bears mushrooms itself.

These spores are microscopic bodies, globular or ellipsoidal, and commonly measure about one-half a thousandth of an inch in diameter. They are interesting objects under a compound microscope of sufficient power, as then their form and their nuclei are plainly discernible. The color of the spores of a specimen forms the first characteristic to be noted in the process of assigning it to its proper genus. Every species of the gilled mushrooms falls within one of the following five color divisions: That comprising mushrooms with white spores (leucosporæ), pink spores (rhodosporæ), brown or rusty spores (ochrosporæ), purplish spores (porphyrosporæ), and blackish spores (melanosporæ). These colors merge one into another in a manner that is somehat confusing, but still it is of the very first importance to know at the start the color of ink in which one's specimen is going to put itself on record.

But now how to arrange matters so that our mushroom may subscribe his family name in his own quaint way. He will furnish the ink, but we must furnish the paper. Procure some sheets of white Bristol board or stiff paper, and also prepare some gum arabic solution—very weak—a teaspoonful to a pint of water (McIlvaine). By means of a brush, coat a circular portion of the paper somewhat larger than the cap of the mushroom and allow the same to dry. The specimen selected should be fully grown and perfect. Then cut off the mushroom stem close to the cap and place it gills downward upon the prepared surface Place a tumbler over it to shield it from dust and drafts and to confine the moisture, which must be depended upon

to soften the gum and make the record permanent. Then leave the specimen in quiet to carry out the process, which may require eight or ten hours. Since the spores are produced mostly upon the sides of the gills, they form, in falling and adhering to the paper, a beautifully exact image of the gills themselves, with all their peculiarities of arrangement, in a manner that a human artist might vainly try to equal. So exact is the copy of the gill structure in the natural color of the spores, that this mushroom signature may go far toward revealing the identity of its interesting producer. Sometimes it is found that the spores of a particular specimen are so delicate in color that they do not show to advantage upon the white surface, in which case stiff black paper should be substituted for the white.

A series of these "spore prints" certainly makes a very beautiful and valuable collection and, if accompanied with full notes concerning the peculiarities of the specimen from which each was made, one of real scientific interest.

Nature Notes.

BY WILLIAM H. HUSE.

Instances have been known of attempts of birds to decorate their nests, but it is not often that robins are included among the æstheitic. They must be now, for recently a robin's nest was found with a strip of yellow ribbon seventeen inches long and an inch wide, and considerably frayed on one edge, loosely bound about the top. The ends were securely interwoven with the straw and fine roots. It apparently serves no purpose in the structure of the nest and looks like an evident attempt at decoration.

Nests seem to have been built in strange places this year. A robin's nest on a stone wall was found in May. On June 6, a brown thrush's nest was discovered fourteen feet from the ground in the interlaced branches of two small red maples. This is rather an unusual height even for this bird which builds in a variety of locations. To match this a catbird is now occupying a nest in the top of an apple tree about the same distance from the ground.

Three Rare Birds.

BY A PINFEATHER ORNITHOLOGIST.

If you go down the Bedford Plains Road to the Glenwood addition, pass Erie Street therein, and pause by the old cellar on the left, you will probably hear, after a bit, a strange song to Manchester ears. A series of chromatic zees, eight or ten of them, will tell you that there is a Prairie Warbler out there to the left somewhere in the scrub pines and tiny oak trees. You will confuse his notes a little at first with those of the Field Sparrow, the end of whose song has half the tendencies, sung so rapidly as to almost become a trill. The Prairie, on the other hand, is more deliberate, and has no preamble to his

zee
zee
zee
zee
zee
zee
Zee

while the field sparrows give several slow notes by way of prelude to their quicker trill.

Dendroica discolor is very accomodating after he has drawn you to him by his song. He sits on a bough, four or five feet from the ground, and lets you inspect him at quite close range. First he shows you his greenish upper parts with that large chestnut patch between his shoulders, which is his distinctive bit of coloring and somehow very hard to see. He lets you see his brownish tail and wing tips, his yellowish wing coverts and then he will sing for you.

The way he puts his head back and opens his bill very wide, and humps his back by way of attitude, shows you that he has his own ideas in regard to Delsartian singing position. Then he droops his tail, and beats time with it, in such a way that you say to yourself, "There is his metronome." Now he flies to another tree—never very

far off—and this time it is his golden front he shows to you. Brilliant yellow he is in his politer aspect, with black velvet streaks on his golden sides. And now you see one of these has aspired to something higher, and grows into a long crescent under his eye. Over the eye is a lighter yellow streak, and another black velvet streak goes through it.

So far as I know this bird has not been reported from this region before, and had I not lived four summers a close neighbor, with daily visits to and from him, at Martha's Vineyard I should never dare to report him officially now.

With us in New England he is a lover of scrubby woods and sandy stretches where stunted bushes grow. In the densest of swampy tangles one looks for the Florida prairie warbler, even in nesting time, while those of the birds which come northward to nest prefer the dry, open scrub.

The House Wren is another rare bird in this locality, and I gladly report him as being unmistakably visible on a low stone wall on the Weston Road. He ran up and down the stretch of stones several times for the benefit of his observers and then dived off into the bushes. A repeated visit failed to reproduce him.

The Prairie Warbler has been seen on four different occasions in almost the same spot on the Bedford Plains, (and heard on several other visits,) when I took some doubters down to see him. My last record of him is June 16. I have seen eight individuals there and heard several more.

The Cliff or Eave Swallow is now a rare bird in this vicinity and I had given him up as having forsaken us for a locality where farmers were not so tidy about their barns. June 19 I saw a dozen or more on Hanover Street near the Young Road, gathering mud for nest repairs, I suppose, for the books say that now is the time for the laying of a second set of eggs. Do these birds use the same nest for both broods? Let him that knows answer.

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More Bird Notes.

BY FREDERICK W. BATCHELDER.

In my last article I expressed regret at not having heard the song of the Hermit Thrush this season. On July 12, at the top of the southeastern Uncanoonuc, I had the pleasure of listening to the songs of several of these thrushes during a whole afternoon. It was a perfect summer day. The light breeze just stirred the leaves and kept the air fresh. The mountain and its inhabitants, and its visitants, too, were in a state of tranquil happiness, a state most exquisitely voiced by the strains of these superb singers. There was a large colony of them to the southward of the tower amongst the tangle of underbrush and dead tree trunks. We tried to get near enough to the singers to see them, but in vain. The crackling of dry leaves and twigs beneath our feet gave too faithful warning, and the birds were always in the next tree beyond the one in sight. Nevertheless, from previous observations we knew that our singers were Hermit Thrushes, and that was enough.

On attempting to transcribe the song of one of the best singers among them I found that my recollection of the

song of two years ago was not more different from that, than that was from several of the other songs. The trills noted in the former transcription were replaced by tremolos of quickly alternating, concordant tones, somewhat after this fashion:

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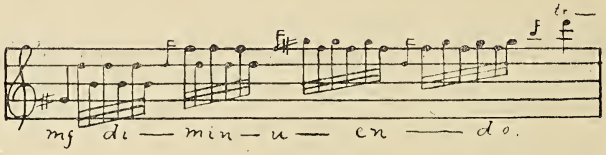
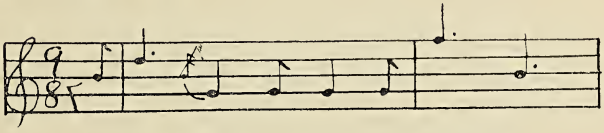

Some of the party who were well acquainted with the song of the Wood Thrush were rather dissapointed in that of the Hermit. The very word "Hermit" suggests something romantic and unusual and raises anticipation to an unreasonable pitch. It was the general opinion that while the song of the Hermit is exquisite in intonation and form it is surpassed in richness and in a certain vibratory power by that of the Wood Thrush. Like the latter, the Hermit has the trick of occasionally repeating a phrase at such a high pitch that the tones are scarcely audible. In effect they resemble the harmonic tones produced upon a violin. The illusion of distance, too, suggests that the bird is practising a sort of ventriloquism.

On our return towards evening the Veeries were singing their vespers and making the dusky woods ring again. Even with the music of the Hermits still ringing in our ears, we could not help admitting that in purity, wildness and a certain ecstatic quality the Veery was, after all, unexcelled.

There are four birds whose songs the unpracticed observer is very apt to find difficulty in distinguishing. Two of them are well known to almost every one, the third is more common than is generally supposed, and the fourth is locally abundant and becoming more so since protected by law. These are the Robin, the Oriole (also called the

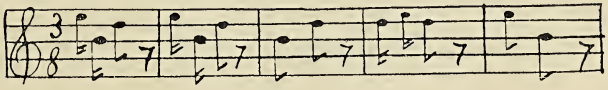
Golden Robin), the Rose-breasted Grosbeak and the Scarlet Tanager. Having had occasion to assist many in learning to distinguish these birds from each other by the song alone I appreciate the difficulty which the beginner has to contend with, and for his encouragement will say that his perplexity is nothing to be ashamed of. Nothing but experience, reinforced by patience, can bring certainty.

What the observer needs to do above all else is to see the bird sing and then learn gradually to associate the song with the bird. He will by and by find that each bird's song has a form, a rhythm of its own. The Oriole is rather a whistler and shouter than a singer. Sometimes he warbles very sweetly to his brooding mate, but his usual song is a vigorous call,

No. 2. 

Come here, Joe, I want to kiss you!

The Robin perches on the top of a tree and reiterates the same succession of phrases over and over again from early morn (too early morn, sometimes) till dewy eve. Individuals vary greatly in quality of tone, some of the finest singers approaching the true thrushes. Others are utterly commonplace. One who regales my waking hours before sunrise can say nothing but this:

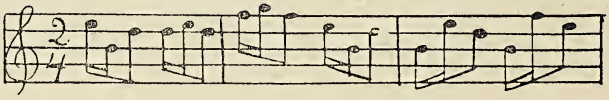
No. 3. 

Here you are, here you are, Bridget, hurry up, kick you.

Another has several times deceived me into the belief that a Wood Thrush had condescended to visit the neighborhood.

There is no doubt that the song of the Rose-breasted Grosbeak, glorious as it is, is frequently attributed to the Robin. Persons hear the song and remark upon it, perhaps, as being unusual, but do not take the trouble to trace it to its source.

It will be noticed that I have put the song of the Robin in triple time, indicating that the rhythm is in threes. This is commonly the case with his song, though sometimes, when he is in a hurry, it approaches double time. The song of the Grosbeak is always in double time, the rhythm being in twos.

No. 4.

Aside from the difference in rhythm there is a great difference in quality of tone, that of the Grosbeak being full, rich and sweet. So when you hear what you think is an especially gifted Robin get your opera glass quickly and turn it on the singer. Very likely you will see not a Robin but a black and white bird with a patch of the most brilliant rose red on his breast. If you can get near enough to see his bill you will almost laugh. It is huge,—more like a nose than a bill, whence the name, Grosbeak.

The fourth bird is not likely to visit you in town. If you want to see him, go just outside of the city or village, where mixed woods of pine and oak line the road, and the sweet smell of the forest hangs in the air. You may hear a song which at first seems as rich and sweet as that of the Grosbeak. About at the third phrase it degenerates into that of a rather inferior Robin, and at the fourth or fifth becomes so exceedingly harsh that you wonder if the voice is not cracked. At every new rendering of the song the deterioration in quality is manifest, so that it is evidently characteristic of the singer. Follow him up, and you will

see the most gorgeous of all our summer residents, with body glowing like a coal of fire against the green of the pines. This is the Scarlet Tanager, formerly more abundant in the taxidermist's shop than in the woods; now, thanks to the awakening of human sympathy, allowed to dwell unmolested in this part of the world. The call of the Tanager is very characteristic—just the two syllables, "chip—cher-r-r."

When one knows these four kinds by the plumage alone, he has made a step in the direction of bird acquaintance; when he knows them by the song alone, he has progressed a long way and may be confident of achieving any success he may desire in the line of bird study.

"A Bird in the Hand."

BY DOROTHY MAY.

A bird had fallen ill, and, seeking to escape the boisterous playfulness of her healthy fellows, alighted for a second upon my wrist. Then I watched her with a throb of pity as, following the sure instinct of all sick or wounded life to hide itself in its suffering, she flew slowly to a sheltered corner. But, oh! the touch of those little feet upon my wrist! How it set my heart a-thrill! Nothing is so fascinating, nothing so stirs the springs of tenderness, unless it be the clasp of a baby's tiny fingers.

I fell to thinking of other times when I had experienced that witchery of "a bird in the hand." Twice it was a Humming-bird; and both times, led by its pitiful cry, I found it tangled in the web of a gorgeous yellow and black garden spider, who was looking in dismay at the complete ruin of its home, with the pretty zigzag of white silk in the center. She never bargained for such a big bug. It was

no easy matter to extricate the little prisoner. Spiders' silk is surprisingly strong. And when at last he lay in my hand, bound wing and foot, and paralyzed with terror, it was still harder to disentangle those tiny, tiny feet. I never so realized the Brobdingnagian size of my hands.

A Chipping Sparrow, attracted by blossoming plants in an open window, slipped in between the upper and lower sashes, where he was singing for dear life while I was puzzling my brains in an effort to rescue him from his predicament. Finally I drew down the lower sash, which brought him up where I could "scoop" him out, when he flew away like a flash, still excitedly singing. He left all his tail-feathers behind, however. Fright has a strangely loosening effect on a bird's feathers, and as it was two months before his new suit was due, we could easily trace him while he went cheerily about his duties as the father of a family.

A Chebec and a Black and White Warbler were caught in the same way in the stable window, where they had come for insects. But they took life differently from Chippie, and when rescued, lay in my hand in a fine tremble of fear for a full moment before flying.

A cuckoo, seeing some large pet birds in a window, was minded to make a friendly call, but not knowing the strange fact that in house walls there were square spots of air that resisted one's progress, he flew against the window with such force as to throw him back on the ground, apparently dead. I picked him up and held him tenderly in my hand, and after a time he struggled to his feet, which he twined tightly about my finger in an effort to steady himself. The pretty, graceful creature stood there a long while, and so won the heart of me that to this day I have to confess to a sneaking fondness for the Cuckoo, despite the bad things which people say of him, and which I fear, alas! are deserved.

And then the young Robins, Bluebirds and Orioles which tumbled from the nest, or were blown out or thrown out—they are not so lovable before the feathers come, when they are all legs and beak and stomach, with a wobbly neck to hold them together, but when they first start out to blunder about the world, they are exasperatingly witching. I remember a baby Catbird who fell behind a large box, where he cried lustily for help, and who, when I fished him out, clung to my finger as if it were a live wire and he could not let go. The old birds flew about with frantic cries to him of his danger, but he only clung the tighter.

And the Chickadees—two succeeding winters I saw one drop from a tree to the snow, where lay struggling convulsively for a moment and then became quiet. When I brought them in the house—fearing they would freeze—it was bitterly cold—they seemed dead, and it was fully five minutes before they revived. I have never understood it, what ailed them, but I do know that of all "birds in the hand," this little "feathered atom defying death" is—well! he makes me wild with delight!

The Ox-eye Daisy.

BY SUSY C. FOGG.

Like the English sparrow (Passer domesticus) and the Cabbage butterfly (Pieris rapæ) there has come to us from European shores, and probably earlier to that continent from Asia, a pretty weed called Chrysanthemum Leucanthemum, or, in common parlance, the Ox-eye daisy, the word daisy being the well-known corruption of the Anglo-Saxon dæges-eage, day's eye, which is of more than usual fitness, since at nightfall, or on the approach of stormy weather, the ring of white ray florets closes gently over the yellow eye, and the flower is fallen asleep.

A long list of other common local names has been applied to this much-admired, much-despised flower, among them being White-weed, Dog-, Bull-, Butter-, Big-, Midsummer-, Moon-, Horse-, Poorland-, or Maudlin-daisy, Dutch Morgan, Moon-flower, Moon-penny, Great White ox-eye, Poverty-weed, White Man's weed, Herb Margaret. (Britton and Brown).

It is commonly distributed over the northern and eastern United States; less abundantly toward the South and West; yet to the friend living in northern Ohio a New York daisy field proved a revelation of beauty never witnessed before.

The daisy has taken kindly to our soil, and has evidently come to stay. It does not ask for much; any waste place will do, and every year the whiteness grows till a veritable Milky Way has dropped from the sky. Beginning with May, it claims all months for its own into the fall season, but it especially loves the June days and the company of the buttercups and clover and swinging, blossoming grasses, and it then puts forth its best show..

Occasionally, unbidden, it nestles among the mowing fields, and the practical farmer is at once upon his guard. To him, a daisy is a worthless thing, exhaustive to the soil and suggestive of poor land. Though the stalk be lain low and the heads allowed to wither and die, which, like others of the Composite family, contain a disk of countless flowers, holding in development the seed of future daisy offspring, still the root remains, a perennial, and at least as many starry eyes look upward with the recurring seasons. It can be exterminated by pulling root and branch. John Bartram, that early pioneer botanist of America, back in the days of about 1758, in writing "a brief account of those plants that are most troublesome in our pastures and fields, in Pennsylvania, most of which were brought from Europe," thus mentions Leucanthe-

mum: "Leucanthemum is a very destructive weed, in meadow and pasture grounds, choking the grass and taking full possession of the ground, so that the fields will look as white as if covered with snow; but the hoe and plow will destroy this weed."

The small double English daisy, that grows only by cultivation in our lawns and gardens, was the "wee, modest, crimson-tipped flower" of the Scottish poet. the "gowan" of Scotland and the "bairnwort" of Yorkshire, and is most dear to English eyes, since, we are told, it is as the grass of the field in abundance. The Christmas and Michaelmas daisies are included as species of aster.

Any plant out of place or out of use is a weed, no doubt, but to the simple-hearted poet, to the nature-lover who inquires into the flowers of its golden heart and finds there the same painstaking care in arrangement of organs that he finds in the lily, to that childhood which is unconsciously drawn to its bright, starry heads, and the schoolgirl who shyly pulls off the white fringe as she repeats the magic words, the daisy is only a type of modesty, grace and innocence, and who cares what a daisy says! Who cares what a daisy does!

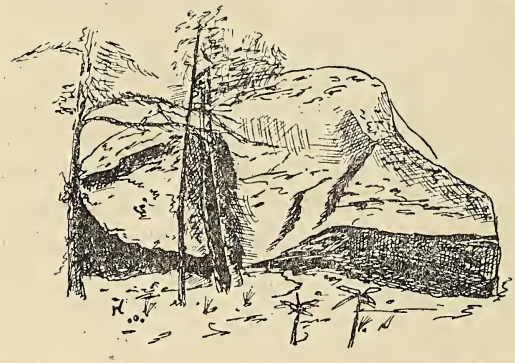
Nature Notes.

BY WILLIAM H. HUSE.

Last year I reported the first Blanding's box Turtle I had seen in New Hampshire. I was confident then that it was a rare find. I am not so certain now. On April 28 two females were brought to me that were found–one in Manchester, the other in Auburn. On June 19, another was brought to me by a boy. It is the largest yet found about here, measuring eight inches in length of shell. It is probable that this turtle is not so rare as I at first thought

but it is certainly not very common. It would be of interest to know its distribution in the state. From this last specimen I have learned that its principal food is insects, beetles forming a large part.

In the northern part of Windham is a boulder that is somewhat noted under the name of Butterfield Rock. It is not quite so large as the two nearer Manchester, described in NATURE STUDY last year by Mr. Hopkins, but is much more conspicuous, as it rests upon a ledge at the summit of a hill. The rock is thirty-two feet long, thirty feet six inches wide and twenty high. The under side is convex, so that there is considerable space under it at one end. A concavity, a foot or two in depth, in this under side has been described as a pot-hole that was formed when the boulder was part of the parent ledge, but I am inclined to regard it as the result of weathering. In material the rock is a coarse gneiss, tending to mica schist in spots. It is coarse grained and shows that some portions are much more easily weathered than others.



On a recent visit to the rock I was fortunate enough to find in a crevice about six feet from the ground a pair of ring-necked snakes, Diadophis punctatus. One, which had lost about two inchss of its tail and was still thirteen inches in length, I succeeded in capturing. The other escaped. These little reptiles, which are among our hand-

somest snakes, are not very abundant in New Hampshire. What this pair could find to live upon in this place, other than the insects and spiders that might come that way, I cannot imagine. It is probable that such was a major part of their diet.

Queer Ways of Walking. I.

BY EDWARD J. BURNHAM.

It is a fault with much of our nature study writing for children that we make too much of what we term the natural order in the development of plant and animal life. The idea is relatively so new, even to the oldest of us, it has appealed to us with such force, that we attempt to load down the child with it, and set him to dragging a chain in his walks afield.

We prepare our text-books in the most orderly manner, and with a gravity which, under the circumstances, is half comical, beginning with man, perhaps, and going back through the long line of vertebrates to the sea squirts; or, we begin with the sea squirts, and climb painfully up to man again, expecting the boy to be profoundly impressed. But he is not. He is sure to disappoint us. Some day, bald-headed and with spectacles on, he may argue with other spectacled bald-heads, and maintain his ground, that, because a cross-vein in the wing of some insect arises from the principal at an angle of thirty degrees, instead of thirty-five, an entire group should be rearranged; but for the present, being a boy, he hates the thought of any kind of chain and the merest suggestion of order.

Besides, there is not, in his time and in his locality, any such "chain" as we tell him of. Any plant or animal that he comes upon is undoubtedly a link, but the link

that follows or precedes it may be across the continent, beyond the sea, or buried in the rocks. The complete chain can be found only in the museums or in the books, and he takes less pleasure in either than in the fields and woods and brooks of his own little world, where the "links" that we discuss so gravely are in a delightful jumble—the chain of development having been broken in pieces ages ago, but the fragments still in profusion all around him.

It is refreshing to observe the matter-of-fact way in which a healthy boy, after watching the beetles scurry away from the overturned body of a dead snake, will turn to the contemplation of the grace and beauty of a milkweed butterfly. He does not care how far apart the beetle and the butterfly are in the scheme of development, or whether the snake has a place in the scheme at all. Gula sutures and subcostal veins are all the same to him—that is, nothing to him; and it is just as well, for the present. Some day the mighty wonder of the order of the universe will dawn upon him, and with all the more force, delight and awe if he has not been made weary before he was able to comprehend. We shall do well, when going abroad with the children, to leave our speculations, if not most of our learning, at home.

We sometimes talk complacently of the desirability of interesting children in nature study, when, in very truth it is ourselves who need the lesson. We have, perhaps unavoidably, become so overwhelmed with business, encrusted with conventionality, that nowhere else in all human experience is a great truth, spoken long ago, so strikingly illustrated. In the fields and by the brooks, "a little child shall lead them." If we are wise we will follow.

In these August days, there is no more wholesome, soul strengthening, body restoring place for us than by the shore of the brook, river or pond, with the children along

for helpful company. The boy knows the choice spots already, despite our solicitous parental restrictions, and the little girl envies him. Just why she half wishes, already, that she was a boy instead of a girl,—that is another study. And the boy is so interested in everything that "goes," and how it goes. He does not know the name of a muscle in his body, but he can use his legs, and delights in them. He has seen the wheels of a watch, of a locomotive, and has tried to follow the feet of a horse in motion. The feet of a beetle, forced through a drop of ink, and then spattering across a sheet of paper—what a joy it would be to him! We will try the experiment when we get home. Beetles are plentiful on the dogbane, the milkweed and the golden-rod. But just now we are by the water, with the clams, or mussels, at the bottom, and "skippers," or water striders on the surface. Here is movement enough, right before our eyes, for one day.

Every New England boy, at least in the country, knows something about fresh-water clams. He has found them quite abundant in every stream and pond in his vicinity, and he has seen collections of the shells on the bank, or near by, where muskrats have gathered for a social feast at midnight. As he grows older he will ponder deeply upon the unselfishness which could prompt and the self-control which could enable the unpretentious muskrat to make provision for the banquet and to share it with his friends. He has probably noticed, too, that where a clam has perished in the water, the two shells commonly remain together, like the empty covers of an old book, while at the remains of the muskrats' supper they are always cut apart, unless the muskrats have been frightened away before the meal was completed, for these muskrat epicures learned, long ago, how to open a clam by cutting the ligature along the back and the muscle that holds the two shells tightly together when the clam shuts itself up.

Every such boy has seen, too, a long line, or little furrow in the sand, under water, sometimes nearly straight, sometimes in graceful curves, and has often found, at one end, the clam that made it, upright on edge, half buried in the sand, but perfectly still and tightly closed. It was walking in the sand until the boy came splashing along; then it shut up, and craftily looked like a clam. If it is left alone, and everything is quiet for a long time, it will begin to move again—very slowly of course, but it can move, and the way it moves is one way of walking.

The two shells of a mussel, or fresh-water clam, are alike–that is, the creature is "symmetrical," at least externally. A narrow line of tough, fleshy substance, called the ligature, holds the shells together along the back, much as the leather binding of a book holds together the two covers. The clam can open and close his shells as he pleases, and when all is quiet around him, he changes from his unsocial, clamlike attitude towards the world, and begins to relax and expand a little. First, after opening his shell, he puts out two fringe-like pieces behind, and begins to take good long, full breaths again. For each fringe has a tube, or "orifice," in it, and through the lower tube the clam draws *in* a current of water which he drives *out* through the upper tube. So these tubes have been named the incurrent orifice and the excurrent orifice. They are not very hard words to remember, when we understand the direction of the movements of water that they stand for. Water contains air, and the clam breathes this air, as fishes do, and some snails, and other creatures that live in the water. The water, flowing in, also brings with it many tiny objects suitable for food which are carried along to the clam's stomach, and thus the clam is able both to breathe and to feed by means of a current of water.

One might suppose that a creature whose food came to

it ready prepared would have no need to roam about. It is a fact that the oyster settles down while still very young and never stirs from home again, but the clam finds it worth his while to move about, even though his steps are slow and his journeys short. The clam's natural position is on edge, about half buried in the sand with the hinge of its shell uppermost, with its fringes protruding slightly behind, and with the two shells parted a little beneath. Between these the clam puts out its foot and works it into the sand below. This foot is soft and seemingly shapeless, but capable of expansion and contraction to a remarkable degree, and very strong. It is stronger, relatively, than the propeller of a steamship, for while the propeller drives the vessel through water, this soft, shapeless mass, called a foot, is able to push the clam's body through the compact sand at the bottom of the stream or pond.

If some of these fresh water clams, or mussels, are taken home and placed in a pan filled with sand and water, they will, after awhile, work themselves upright, put out their fringes behind and their foot below, and begin to move very slowly along. But with the slightest jar, as from a touch of the table or of the pan, or perhaps from stepping on the floor, they will shut up again. Clams cannot see, or taste, or smell, and they cannot hear as we hear, for they have no ears, but they can feel, and thier sense of touch is so good that they can detect very slight vibrations in the water. This way of getting ideas from the world around them takes the place of the sense of hearing, and serves a clam's purpose very well. It has some advantages. He never has earache, and when he is bored he has only to shut his shell. Some day, as they grow older, the boys and girls will enjoy learning how this sense of touch, of vibration in the clam, combined with the faculty of knowing when it is right or wrong side up, has developed,

through a long line of creatures and ages of time, into the wonderfully sensitive human ear, which can distinguish the tones and even the delicate over-tones caused by the musical vibrations of a string or an organ pipe. But we are wandering off to the idea of development again. What is of most interest just now is that strong foot, and the strange way the clam walks through the sand. Besides, here are "skippers," actually walking on the water without wetting their feet. But that must make another story.

WANTED: To complete set of New Hampshire Experiment Station bulletins, bul. no. 13; also reports, 3d, 4th, 5th and 6th; also part 2, Tuckerman's Synopsis of N. A. Lichens; Journal of Mycology, vol. 1, or nos. 4, 5, 7, 8, 9, 10 and 11. T J. FITZPATRICK, Box 1497, Iowa City, Iowa.

Revelation.

BY FREDERICK W. BATCHELDER.

In the soul's garden land God plants betimes
A holy seed that from the tree of life
Drops ripe and potent. In the teeming soil
This germinates and bears at length a flower
Fairer than daintiest petal earth can yield,
Whose hue displays His truth, whose form His grace,
Whose perfume breathes His love. Yet in a day,
As God counts days, it perishes, for lo!
Our hot and passionate hands have wrought it ill.
Forbear, O Man, the withered stalk to prize
Too well, lest, when that Will Divine again
Vouchsafes a transient bloom to evolve, absorbed
In grief for loss the old thou of the new
Miss all the fragrance and the loveliness!

NATURE STUDY.

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Birds at Close Range.

BY RALPH HOFFMANN.

Many readers of NATURE STUDY have probably enjoyed Professor Herrick's book, "The Home Life of Wild Birds," in which he describes his new method of the study and photography of birds. It is of particular interest to residents of Manchester to know that Professor Herrick's work has been carried on in the hill country of New Hampshire. It may interest them, also, to read some rough notes of similar work carried on this summer in another part of the State, in connection with the School of Natural History at Alstead.

The first experiment, like Professor Herrick's, was conducted with Cedar birds and proved of even greater interest than I had expected. On July 12th, a nest which was fixed to a maple twig a few yards from the laboratory was lowered to the ground—the twig having been cut off and nailed to some upright posts. At first the old birds were unable to find the nest in its new position. They seemed very much bewildered, and flew again and again from the neighboring twigs to the now empty site. When, how-

ever, the nest was discovered, it took the female only two minutes to light on the end of the twig—in half a minute more she hopped along and fed the young. The nest was now protected from cats by wire netting, and for the next ten days the young birds in the nest and the actions of the old birds when feeding them were under constant observation. The young, probably three or four days old when moved, were homely objects, blind and absolutely naked. When the twig was touched, four yellow mouths, the jaws marked with iridescent red, blossomed out and waved feebly about on their tremulous necks. The old birds soon became so wonted to our presence that we could watch the operation of feeding from a distance of five or six feet, even without the shelter of a tent. The young birds were fed at intervals of from fifteen minutes to a half an hour, but their meals were hearty. The old birds came with their throats stuffed with berries, or, more commonly, with bird cherries (P. Pennsylvanica). As many as nine were brought at one time. With a motion as if coughing, the old bird produced one cherry after another, placing them well down in the throats of the eager young. We could distinctly see at times that the food was removed from one throat and put into another. This, as Professor Herrick points out, happens when the gullet of the young bird does not react at the touch of food.

After the load of food had been delivered, there came always a careful inspection of the nest. As soon as the young birds had voided their excrement it was seized by the old birds and at once devoured.

The male was by no means as bold as the female, and his timidity led one day to an interesting incident. The female had fed the young, but the male remained high in the branches in the tree above, hesitating to venture down. The female thereupon flew to the branch on which he

stood, took his load of fruit from him and brought it down to the young.

On the morning of the 21st of July, the young Cedar birds were standing up in the nest and shaking their wings vigorously. They already made a faint note, similar to the *cree* of the parents. They stood so high when she fed them that it was difficult for her to reach into their mouths. The next morning, by half-past eleven, one had left the nest and was up in the tree above. At half-past one in the afternoon the remaining three left the nest with a rush. They flew to the grass about forty feet off. The parents were very much excited, and when the young flew in any direction, one of the old ones flew with them as if to encourage them. The next morning all the young were gathered again in the branches of a thick tree near by.

An interesting example of the force of habit was afforded by the female, after the young had been out of the nest for some time. Though she had assisted them in their flight, she flew with her load of fruit to the twig where she had alighted so often in the last ten days, and hopped along through the dry leaves to the empty nest. After a moment she flew off, and no doubt found her brood in the neighboring tree.

When the school opened, a pair of Chebecs were feeding their young in a nest in an apple tree in front of the laboratory. On July 6th, the young left the nest and were fed all day long in a little group of apple trees. The young sat close together in a row on one of the twigs. On the 8th I was surprised to see the female building again in the same crotch from which I had taken the empty nest. By the 10th she had finished her second nest and was helping the male feed the old brood. On the 14th she had laid one egg in the new nest. She laid three eggs in all, and on the 6th of August I took the nest from the crotch, which

was about twenty feet from the ground, and fastened it into another crotch which I had spliced on a twenty-foot pole. The young were then about a week old. I leaned the pole against the branches of the tree, so that the nest came just below the old site. The Chebec soon appeared, and after twice visiting the old crotch, she found the nest and fed the young. During the morning, by sawing off pieces from the lower end of the pole, I lowered the nest to a height of four and a half feet from the ground. The Chebec adjusted herself each time and fed the young constantly, though several people were sitting within ten or twelve feet of her.

It became evident after a little observation that the female was bringing up this second brood without any aid from the male. There was never more than one old bird about the nest, and her hunting ground was so circumscribed that I could generally follow all her movements between her visits to the nest. When, at rare intervals, a male Chebec appeared in the trees, there was an angry encounter between the two and the intruder was driven off.

The industry of this little female was something extraordinary. She did not bring a load of food, like the Cedar birds, but apparently made a separate trip to the nest with every insect that she caught. The interval between her visits was often less than a minute, and during one period of fifteen minutes she fed the young ones twelve times. Many of these insects were picked up from the grass, over which she stooped and hovered. Others she deftly snatched from the trunks of trees; still others from the leaves. The young, being fed so little at a time, voided their excrement with much less regularity than the young Cedar birds, nor did the Chebec ever swallow it at the nest, but flew off with it and dropped it at some distance.

During the following night there came up a heavy thun-

der storm, the effects of which on the young Chebecs have been, I hope, a lesson to me, and a frank relation of them may, I hope, deter any one who may wish to adopt this method of studying birds from incurring a similar weight on his conscience. Although the Chebec had apparently adjusted herself readily to the new site of her nest, yet there must have been something wrong, for she did not brood over them at night, and when I went out at two in the morning, alarmed for their safety, I found them exposed to the driving rain, wet through and chilled. One never recovered. The other two I kept warm during the night, and the next morning fed them with flies. When the storm passed off I replaced the nest, and the old bird resumed her task of feeding them. The danger incurred in moving the nest from the site selected by the parents is not, as one first supposes, that the parents may desert the young, but that the young may succumb to extreme heat or violent rains. It is difficult to obtain, in the new site, the same amount of shade which the young enjoyed before. This danger must be carefully considered. No one who really loves birds will adopt this method of study from mere curiosity, nor will he fail to take every precution against the dangers above mentioned.

In neither of the cases which I have hitherto described was a tent necessary. I am at present, however, watching the progress of a family of young hermit thrushes. The parents are so shy that unless one's person is concealed they will not approach the nest. They soon became accustomed, however, to a motionless object such as the tent, and through a peep hole of this, I watch the feeding of the young at a distance of about five feet. They are now about a week old; their feather tubes are just bursting, showing the brown edges of their coming feathers. At intervals of from fifteen minutes to half an hour I hear a low, sweet

note, which is generally answered by the male near by, and in a moment the female flies to a twig just above the nest. The spot is an ideal home for this most imaginative of our singers. A little brook flows out from a deep pine wood into a thicket of alders. Its banks are covered with a deep carpet of vegetation, composed of moss, lycopodium, and ferns, in which the leaves of Linnæa, wood sorrel, dalibarda and pyrola show the succession of bloom which it has borne through the summer. Sunk deep into this soft carpet, a foot or two from the stream is the nest. Earlier in the season the male has sung for hours from the branches of the pines, while the female was brooding; now his period of song is over, but as long as I am in the tent, he perches near by and utters the alarm notes of his species, a low *chuck* or nasal *speke* and raises his tail slowly. Even at this late date, an occasional song comes to me in my tent, from a wood peewee, a gold finch, or an indigo bird. On the 18th the first migrant, a water thrush, tripped over the stones in the brook. Red-bellied nuthatches call in the pines, and from far up on the hillside comes the *pill, pill* of the olive-sided fly catcher. The feeling of intimacy with the woods and their inhabitants grows stronger for each hour spent thus silently in their company. I look forward with the keenest delight to the hours I shall spend next summer in the tent beside the nest of—what shall it be,—with all the birds of forest, field and wayside to choose from it will be hard to make a choice; the days will be far too short.

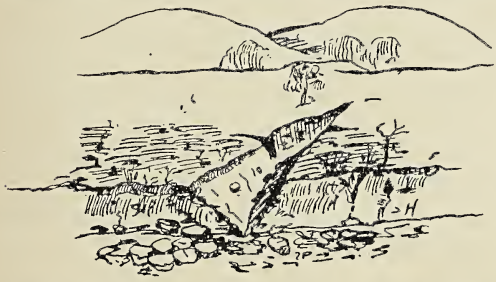
Alstead Centre, N. H., Aug. 22, 1901.

The Making of a Valley.

BY WILLIAM H. HUSE.

There is a story, that is now somewhat classic, of a boy who had faithfully familiarized himself with all the definitions in his geography and declared that he had never seen a peninsula although he had passed one every day on his way to school. Such an incident is typical of the old geography. The new is sure that the boy knows things from nature or pictures though he may never learn a definition. There is no better way to interest a class in geography than to study, on the spot, all the earth forms that can be found in the vicinity. I might say, that is the only way to teach geography.

Of more interest than present forms are the examples of present forces that are at work carving the face of the earth into wrinkles to show its age or smoothing the rugged places that show their youth by their roughness. An example of such carving, that is not only a valuable source of information for pupils in geography, but of interest to older pupils of nature, is the little, eroded valley that may be seen in almost any gravel or sand bank. There was first the steep bluff of a river or brook or an excavation made by man. In the beginning, for there must have been a beginning the melted snow of a spring-time trickled over the edge and as the earth thawed a trough was made that soon became the outlet for all the water that accumulated back of it. The flowing water carried with



it the sand and a few pebbles, causing the gravel above to slide down. This in turn was carried away and more came down in its place. The angle of the banks would be that at which the sand of the given compactness would remain at rest. The little, eroded valley increased in length as well as in breadth.

As we look at it today we see the results of nature's carving. The steep banks of sand that send down tiny landslides as we walk along, the bowlders and pebbles at the bottom, all show how the water worked. This is a miniature of the work that is going on wherever the waters are carrying sand and silt down from the mountains to the sea. It is an example at home, perhaps in our own door yard, of nature at work. It is worth a visit and study.

Life upon a Rose Bush.

BY SUSY C. FOGG.

Upon the morning of May 8th I went to the garden, to find the rose bushes covered with swarms of shining black flies, trim and graceful in appearance, and evidently belonging to the Hymenoptera. They lingered fondly about the branches, and even when disturbed would fly but a short distance and alight again, always on the rose leaves. This decided preference convinced me that they were there for no good. Upon closer examination I found that I possessed in large numbers the Monostegia rosæ, or rose-slug, of Comstock, and Selandria rosæ of Harris, of the family Tenthredinidæ, or Saw-flies. The insect was new to me in its matured form, but its family is nearly as "old as the hills," and this time, it seems, infinitely less respectable!

In the year 1832 it was observed in gardens in Cambridge, but Harris writes that at that time it had not

reached Milton, his former place of residence, and did not appear there till six or seven years later, but gradually it has spread in all directions.

They became so injurious to shrubs in and around Boston that in the summer of 1840 the Massachusetts Horticultural Society offered a premium of one hundred dollars for the best mode of destroying this pest. Various experiments have been tried by syringing the bushes twice a week with water and tobacco juice, an emulsion of kerosene, or a strong solution of whale-oil soap, also dusting the bushes with lime when wet; but perhaps the safest and most efficacious of these is the treatment with whale-oil soap. One successful rose-grower in this vicinity strongly recommends its use; he does not claim it will entirely exterminate, but he says, "They don't like it."

But to return to the insect as it first made its appearance in our garden. It had just come forth from the cells in the earth, in which it had passed the pupa stage, and was ready for the pairing season and the deposition of the egg, which is done in a curious manner. Like others of the Tenthredinidæ, the abdomen of the female is provided with a pair of saws, and when about to lay the eggs she turns a little to one side, unsheathes the saws, pierces the skin of the leaf obliquely, and thrusts an egg into each incision thus made.

In a few days the young, sluggish caterpillars appear and begin their ravages upon the leaves, eating away the upper surface in large patches, and leaving nothing but the veins, which turn brown, and finally the whole leaf withers and drops off. The caterpillars eat by night, and spend the day resting beneath the leaf. They are yellowish green, soft and transparent like jelly, when they first appear, but after moulting several times they lose their semi-

transparent color and become more opaque and more yellow in hue.

At this stage they are about ready to descend to the earth to undergo metamorphosis and come forth in the winged form, as their ancestors have done before, twice during the season, one brood in May or early June, and again in August. Their transformations are passed through rapidly, and the winter is spent in the ground.

The adult fly is little more than three-twentieths of an inch in length, black and shining, with smoky wings, and the first two pairs of legs are grayish white, except the femora, which are mostly black, and the hind legs are black, with whitish knees. The antennæ are noticeably delicate and graceful, and are kept in constant, quivering motion.

Hoping to protect the bushes from the race with the insatiable appetite which was to follow, I began the slow task of collecting the parent flies by brushing them into a jar. The morning was a little cool and cloudy, the flies were hardly awake, and in this case the experiment worked well, but usually the males are active and given to flying about, and are more difficult to capture than the females, which, when disturbed, are wont to relax their hold upon the leaf, and drop as if dead to the ground below.

"The underlying object in all our teaching is to make seeing, thinking, self-reliant, honest men and women. All branches of natural science, rightly pursued, are powerful means to this end."

Binny's Death.

No other beaver ever came to be so famous as did Binny, who arrived in England in the year 1825, "very young, being small and woolly," and whose good hap it was to fall into the hands of W. J. Broderip, the naturalist, who made a pet, as well as a study, of him, and told the story so entertainingly in his "Leaves from the Note-Book of a Naturalist." To this day, not infrequently, reference is made in scientific meetings to the wonderful instinct which prompted this beaver to begin building a dam as complacently on the third floor of a house in London as if he were in his native woods in Canada. Mr. Broderip wrote long before it had become the fashion to ascribe human emotions and impulses to representatives of the lower types of the animal kingdom, but the simple account of the death of his pet has come down to us, the record of a case of genuine homesickness. The story of Binny's visit to the Tower, and its fatal consequences, as also of his clumsy play with his friend, the white fronted lemur, is as intesesting today as when it was first told, three-quarters of a century ago;

"The houskeeper was very fond of Binny, always consulting his comfort and appetite making his bed warm and treating him frequently to Sally Lunns and plum-cake, till he became the most plump and sleek of beavers; and the attachment was reciprocal. At last, on the writer's departure from London for some time, he thought that Binny, who had grown excessively fat, would be better for exercise and change of air, and would be more comfortable if sent to pay a visit to the Tower of London and expatiate there. Mr. Cops, the keeper of the lions, kindly undertook to take care of him. He was suffered to go at large and had every accomodation, but soon began to fall off on his appetite. In vain did his kind host try every delicacy to tempt his guest. With the exception of a few raisins, the dejected animal would eat nothing, and fell away visibly. Fearing the worst, and suspecting that it was pining for its home, Mr.

Cops brought it back to the housekeeper. The poor beaver immediately recognized her, uttered his little cry, and crept under her chair. But the blow had been struck; he never rallied, but died, as the good, old housekeeper declared, with tears in her eyes, of a broken heart. His skin is preserved in the museum of the Bristol Philosophical Society. Poor Binny! He was a most faithful and entertaining creature, and some highly amusing scenes occured between the worthy but slow beaver, and a light and airy macauco that was kept in the same apartment."

A Bloodthirsty Beauty.

BY WILLIAM H. HUSE.

A dead bee hanging from a yarrow corymb recently attracted my attention. It resembled some people in having no visible means of support and that looked suspicious. A

closer inspection confirmed my suspicions. His neck was firmly clasped by the mandibles of a crab spider scarcely larger than itself and the poor bee had already breathed her last. My pity for the victim was short-lived and gave way to interest in the captor which was an excellent example of protective coloring. Of a creamy white, with just enough pink markings to relieve the monotony of color, it was a beauty and with its similarity to the flowers on which it rested it had only to wait where bees were sure to come to be equally sure of its dinner.

This spider belongs to a family of arachnids that spin no webs but lie in wait under leaves and in flowers, like highwaymen, for their victims. No; let us not say that. Such gentlemen are disreputable because they hunt us. These spiders hunt like sportsmen who build bough-houses for concealment and wait until their game comes within gunshot.

Queer Ways of Walking. II.

BY EDWARD J. BURNHAM.

The purpose of nature study, as it is at last beginning to be understood, is not to make scientists. Here and there, one among many thousands, will be a child who will love science for its own sake, and such an one will find a way to get forward. There were great scientists long before the fields were thought of as the best "child's garden" in the world. The primary object of nature study should be the development of the faculties of mind and body ; to encourage habits of observation and reflection ; to lead the child to see clearly and think rightly. Along with this development of faculties which will be of inestimable value in every walk of life, will come greatly increased possibilities of rational enjoyment, and this, too, is no light matter in a work-aday world. But the help that nature offers in building up the body and developing the mind for the duties of life is the chief thing.

Those who would help the child to a knowledge of the flying, creeping, running, blossoming objects around him, will have little difficulty if they look upon the fields, brooks and woods with their inhabitants and the child also, as parts of a vast kindergarten, and study the child along with the objects in which he is interested. The child is at first a generalizer ; it is only by observation and reflection that he becomes a specialist. He goes forth in the morning and feels, rather than sees, that the world is full of life. All the vast range of objects is at first vaguely blended and but dimly perceived. Then follows a closer inspection, and attention is centered upon the bird in the tree, the bee in the blossom, the skipper or water strider on the surface of the pool.

The next step is as natural, if the child is encouraged to take it, and it is wonderful how eagerly and rapidly the boy or girl will go on to the contemplation of the structure and habits of the single object upon which the attention has been fixed. Above all, the child is eager to know the names of things, if only the thing itself has aroused interest. Words are "hard" only when associated with school and tasks. Rhinoceros is no harder word than lion to the boy who has seen both animals in the menagerie. In the present series of papers, the "preachments" are, of course, designed for the elders, but the studies themselves are for the old and young alike, although there is no attempt at the so-called simple language. Children resent "baby talk," and rightfully. Besides it is unnecessary; we do not go on all fours to teach a child to walk. A long string of meaningless words in a botany lesson, is one thing, the correct name of a plant or creature that is known, is quite another thing, and so also of the parts when their use is understood. Not infrequently it seems as if the longer the name the more delight the child takes in mastering it.

From early spring until late autumn the "skaters," or "skippers," or "water striders" may be seen on the surface of ponds, and of quiet pools in brooks and rivers, actually walking on the water. If we find a place where the bank is low but abrupt, and, lying prone, work ourselves carefully forward until our heads are over the water, we may watch them at close range, for some of them will in time come directly under our eyes, if we lie perfectly still. They are graceful creatures, wonderfully active on occasion, but for the most part moving leisurely about or remaining at rest for long intervals. They have six legs, as do all true insects, and the middle and hind pairs are very long and slender. These rest upon the water, the middle ones spreading out at nearly right angles to the body and moving like

oars, the hind ones reaching backward and serving as rudders for steering. The front legs are stouter and shorter, and are generally held above the water, though sometimes the insect rests upon all six of its legs at once. The body does not touch the water, but is held up by the long thighs, much as a stool is supported by its legs. Where the long, slender shanks and feet rest upon the surface, they form little dents or depressions, as if the water were covered with a very thin, strong sheet or blanket, and we shall learn by and by that this is true. If the water is not very deep, and there is a sandy bottom, we shall see, when the sun is shining, the shadow of the feet and of the body, and around each shadow made by the feet there will be a bright golden ring. Some day, perhaps, we shall learn about light, and how its rays are bent by the dents in the water, and why it makes these bright rings. The shadow of the body has no ring, because the body does not touch the water, and, of course, makes no dent in it.

While we are watching, a fly, or mosquito, or other small insect may come flying over the water, and then our graceful, leisure-loving strider will show how sharp of eye and quick of motion it really is. There will be a stride, a jump, and the wanderer has been seized by the strider's strong fore legs and sharp claws, and it was all done so quickly that the eye could not follow the motion.

If we carefully place a perfectly dry sewing needle upon the surface of a glass of water, it will float, although steel is many times heavier than water, and it is a general rule that an object which is heavier than the liquid in which it is placed will sink. The needle will make a depression in the water, as the water strider's foot does. But this is an experiment for the home or school room, and we are out of doors.

Almost always the water in a pond or stream is either

rising or falling. It is seldom stationary for any great length of time, and if it is rising, we shall see, around the grasses and rushes standing in it, little depressed rings, like the depressions made by the needle and the strider's feet. If the water is falling, there will be a raised ring, instead of a depression, around the grasses and rushes. Water, whether rising or falling, flowing or at rest, is covered by what is called a surface film. It is very thin, so thin that we can scarcely conceive of it, and yet it has considerable strength and is stretched tightly by what is known as surface tension. This film, with the tension or pull which holds it stretched over the water, explains many things about the action of water and other liquids, and among other things that it does it makes a safe floor for the strider to walk upon. So we see there is no longer any mystery about this queer way of walking.

The strider lives upon the juices of insects, which he catches with his strong fore legs. He has a long, sharp beak, with a bristlelike piercer which he can move in and out of the beak while boring a hole through the hard covering of his prey. The beak is hollow, for sucking, and when all the fluid in the insect's body has been drawn into the strider's stomach, the empty shell is thrown away, the jointed beak is laid back beneath the head and between the fore legs, and the water strider rests upon his film floor or moves about with long skips or strides, ready for another victim, for his lunches are usually small and he is always hungry.

Some creatures that do not walk upon the water, but live in it, often come up and rest by the help of this wonderful surface film, and there are others which move along, clinging to its under side. This is another queer way of walking, and we will see what we can learn about it when we go abroad next time for a bit of nature study.

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Vacation Notes Among New England Homes.

BY MARY HAZEN ARNOLD.

So many charming fresh air friends have kept open house for us this summer, that we are tempted to pass on a few of the good times to our friends who enjoy watching the bird architects.

During the last week in May it was our good fortune to discover Madame Wood-thrush just as she began to lay the foundations of her summer home. She brought sticks and long grasses, arranging them with greatest skill among some berry bushes beneath the alders, shaping the inner circle with her round breast, seemingly caring little for the watchers on the hillslope near by.

Nearly two weeks elapsed ere the structure was considered good enough for the four eggs of blue. Then followed the patient weeks of waiting and care before the miracle of transformation was completed, and I have never seen a prettier sight than that of the mother thrush sitting on the edge of the nest, while within its brim clustered the four young birds with their spotted breasts, looking out with bright eyes upon an untried world.

In the woods beyond the home of this little friend in brown, was found the little mound of leaves and straw up-

on the ground among the ferns, where the oven bird guarded her eggs. On our approach the golden-crowned father gave his warning cry,—Teacher, *teacher*, TEACHER! and tried to lure us away into the woods, while the little mother in her green garb slipped away among the leaves.

The round doorway at one side of the little Dutch oven seemed hardly large enough to admit its occupant, but within the arched dome was ample room. It seemed strange that no passing footstep had crushed the little home so skillfully concealed beneath the leaves.

Of a very different type was the home of a night-hawk which we visited. In reality she had no nest at all, she simply camped out on a bare granite rock, which lifted its head just above the surface in an unmown field, within a short distance of a dwelling.

For two weeks, indifferent alike to the scorching rays of the sun and the pelting rains, the little gray and brown babies nestled at their mother's side, the mottled feathers of the trio blending so perfectly with the gray rock that they were almost invisible. If an interested observer came too near, the bird would fly to a branch of an apple tree near by, where she would remain motionless, stretched lengthwise on the branch, apparently part of it.

At dusk the two old birds could be seen darting about for their supper, which, if their words were true, consisted of "Beef" and "Pork."

The small boys of the neighborhood paid unconscious tribute to the labors of the Audubon Society's secretary during the past summer, for though frequent visitors, not one of them thought of disturbing the little family in the least.

If time and your patience were but limitless, I should like to tell of the home of the phoebe, built by the roadside under an overhanging bank—of the chewink just across the road, whose nest beneath a charred stump held four creamy eggs heavily mottled on the ends with brown—of the scar-

let tanager's rude structure of twigs in the woods—of the redstart's nest of fiber saddled on a maple bough—of the orchard oriole's residence in an oak—of Robert White with his six brothers and sisters in their brown coats taking a stroll through the woods—and especially of the wooing of six pairs of brown thrashers who poured forth such liquid melody one early May morning.

The tale of these and many others which gave zest to summer rambles must remain untold.

Waterbury, Ct., September 1, 1901.

Organotopic Plants. I.

BY FREDERICK W. BATCHELDER.

In hunting for rare plants the amateur collector once in a while comes across specimens which attract his attention by the singularity of their aspect and habit. Instead of "green things growing," they are brown or yellow or white things growing. They are also destitute of leaves, or the leaves are reduced to mere scales. Now greenness is so nearly a universal attribute of flowering plants that the absence of it must be significant. The absence or reduction of the leaves, which are usually of vital importance in maintaining the processes of nutrition and circulation, must be no less significant.

The question at once arises, why have these plants no chlorophyll and why have they failed to produce proper leaves? The answer is, because they do not need them. This is evident from the fact that they live and thrive without them. Why they do not need them is another ques-

tion, and cannot be answered in so few words, though it need not take long to enumerate the main points. These plants need neither chlorophyll nor leaves because, either, first, they derive their nourishment from the elaborated food of other plants upon which they fasten themselves; or, second, they live upon the organic matter resulting from the decay of other plants; or, third, they form partnerships with other plants, both partners deriving equal benefit from the combination. Green plants construct their own food; these queer plants beg, borrow or steal it.

The plants in the first group, those which actually steal the assimilated food material of their hosts, are the true parasites. Those in the second group, living upon the results of vegetable decay, are properly called saprophytes. The third group, plants which form partnerships with other plants, are now known as symbiots, the condition of the allied plants being called symbiosis, literally, a living together. Closely allied to the first group are certain plants which are only partially dependent on their host and are called hemiparasites. Similarly allied to the second group are the hemisaprophytes. As might be expected, these sub-groups consist of green and leafy plants whose predatory habits have not as yet accomplished their total degradation.

Besides these groups of colorless plants and their allies, there are also included in what is now called the "organotopic" flora two others, the epiphytes and the insectivorous plants. The epiphytes are included because they locate themselves upon a host plant, drawing nourishment from the moist air of their habitat. They lodge, but they do not board. The insectivorous plants constitute an outlying group, remarkable for the habit of deriving organic compounds from decaying animal matter.

An enumeration of the several groups may serve to fix them in mind and make it easier to place local plants to be

described below. They are, first, epiphytes; second, parasites and hemiparasites; third, saprophytes and hemisaprophytes; fourth, symbiots, and fifth, insectivorous plants.

Locally we have no epiphytes among our flowering plants. Persons who have been so fortunate as to visit Florida or other sub-tropical regions have seen with delight the Polypodium and the Spanish moss and the beautiful orchid, Epidendron, clinging to the live-oaks and the magnolias.

There are in our area but five true parasites. The commonest of these is likely to be found in the edges of fields or along watercourses, twining its slender yellow stem about the larger herbs, especially those belonging to the composite family, with an embrace all too ardent. If you look for a root you will probably find none. The plant germinated in the usual way from a seed and had at first a root, but after it had taken firm hold of the host plant it proceeded to develop, at the points of contact, little suckers through which in the course of time a complete circulatory connection was established. This end having been attained, nutriment was drawn wholly from the host, no further connection with the ground was necessary, and the root, having nothing to do, got discouraged and died. This parasite is the dodder, more poetically and also appropriately called in the South, "love vine." The dodders constitute a family of themselves, closely allied to the convolvulus family. In our local species, Cuscuta Gronovii, the tiny white flowers grow in compact masses, sometimes as thick as a man's thumb. In some parts of the world the genus is a serious pest.

The dodder is a stem parasite. Our only tree parasite is the dwarf mistletoe, a minute plant which few but botanists have ever noticed. In the spruce forests or swamps there are sometimes seen, mostly on spruces, occasionally on other conifers, curious abnormal growths known as

"witches' brooms." Certain branches have developed clusters of greatly elongated branchlets which have assumed a horizontal position, the whole collection being very broom-like in aspect. These abnormal growths have been caused by the little parasite Arceuthobium pusillum (Razoumofskya pusilla), closely allied to the western and southern mistletoe. As the plants have stems less than an inch in length it is not strange that the species has been little known. It is especially interesting to us as being the only parasite in this region which germinates directly upon the host plant.

[For very interesting accounts of the dwarf mistletoe the reader is referred to *Rhodora*, Vol. II., No. 13, where are also excellent plates of host and parasite and "witches' brooms."]

Beside our one stem parasite, the dodder, and our one tree parasite, the dwarf mistletoe, we have three root parasites, all members of the broom-rape family, so called because the type species infest particularly members of the leguminous family in the old world known as "broom." Our species inhabit principally dark, damp woods where leaf mould abounds. There is a wood on the shore of Lake Winnipesauke where I have found all three species in abundance. The first is cancer root, Aphyllon uniflorum, (Thalesia uniflora), sending up from an underground stem slender scape-like peduncles which bear violet colored or whitish flowers. The second grows under beech trees and is a branching plant with numerous flowers of two kinds, the upper ones larger and open, the lower ones smaller and closed. As occurs in some other plants, (e. g., Polygala and Amphicarpæa,) it is mostly the lower cleistogamous flowers which produce the fruit. This plant is the true "beech drops," Epiphegus Virginiana (Leptamnium Virginianum,) the plant known as "false beech drops" being a species of Monotropa, of which, more below. The third

species is well called by Gray "a singular plant." I had never seen it and was too late to find it in flower, but in searching under some oaks for other plants I noticed what seemed to be some dried pine cones sticking out of the ground. It struck me that their erect attitude could scarcely be the result of accident and I examined them more closely. Of course I was delighted to find that I had at last got my long sought "squaw root," (Conopholis Americana.) The plants are but a few inches high and the flowers grow in a dense bracted spike. It is the stiff, scaly bracts which give the spike when in fruit its cone-like aspect.

The so-called hemiparasites are plants which subsist only partially upon the elaborated material of other plants. They fasten themselves by their lateral rootlets upon the roots of the host. They belong mostly to the figwort family (Scrophulariaceæ). Among familiar plants of this kind are lousewort (Pedicularis), painted cup (Castilleja) and some Gerardias. The common bastard toad flax (Comondra) is also supposed to be a hemiparasite.

The other groups of organotopic plants will be considered in a future article.

Nature Study in School.

BY WILLIAM H. HUSE.

With many teachers it is an unanswered question, "What can I teach my pupils about nature and how can I do it?" There are some that do not need to ask that question. There are some who care little about it. It is to help the first that NATURE STUDY goes forth.

Previous to the school age the child gets most of its instruction from Nature herself. There is no system, no course of study, no co-ordination; or rather, there is the best of co-ordination with everything in the child's life. As a result there is interest, joy and accumulation of knowledge that exceeds that of the school life in the same time with its systematized course of study. It is a serious problem that confronts the teacher who honestly attempts to imitate Nature as a teacher. In one New England town noted for the excellence of its schools, nature study has been taught for years. The schools were among the pioneers in the work. A visit to a primary school when the subject was in its glory showed great enthusiasm of the teacher as she dissected clams and taught her babies the anatomy of invertebrates. A subsequent visit discovered an apparent weariness on the part of the teachers which seemed to tell of a disappointment with the work. Such a result was not strange. The instruction had been too scientific. The children were ready to love Nature. They had loved her for years; but they were not ready to dissect her and classify her members. Such work belongs to a later period.

The statement has been made, and I believe it, that it is what the pupil loves and not what he knows as he leaves school that will be of use to him in after life; and the question that confronts teachers is, How can we present Nature to the children so that they will love her? We must

remember that children love everything that has life. They do not care to what order it belongs. Still less do they care for its scientific name. The fact that they have seen and examined a caterpillar today does not necessarily mean that they will be more interested in a caterpillar of an allied species tomorrow. It may be a snake, a flower, a mushroom or a rock that has attracted the attention. Whatever it is, that should be the subject of observation and of study. and let us beware lest our study does not lead us in so deep or last so long as to cause the interest to lag. The moment the children begin to look upon such work as a task, they begin to lose their interest. Child nature cannot go very deep. It is not very deep itself. It is hungry for facts and can accumulate them prodigiously long before it can classify them.

Whatever is at hand should be the subject of a nature lesson. As many facts should be learned as can be remembered and these should be presented so plainly that there will be no confusion. Even then some children with constitutionally crooked minds, like some adults, will go home and report exactly the opposite of what they were told.

Nature lessons can be used in connection with geography to illustrate or serve as a foundation for the text. They can be used as a basis for language work if this be not overdone so as to get them weary of the task; but besides these and independently of these the study of any and all specimens brought into the schoolroom should be taken up for the sake of the love of nature.

It is to all interested in such work that NATURE STUDY has a message. Designed to present facts regarding the natural history of New Hampshire in particular, it is interested in nature everywhere and seeks to carry its message and help, perhaps, to all who care for the beautiful and instructive things with which Nature so lavishly supplies us.

The Planets in October.

BY GEORGE I. HOPKINS.

It is an unusual event for all the planets to be visible in a single evening between sunset and midnight, but such is the case this month in a perfectly clear atmosphere. If the observer will choose a position any evening at six o'clock where he can secure an unbroken view of the southern and southwestern horizon, he will, if the air be clear, see Jupiter and Saturn in the south at an altitude of about thirty degrees, Jupiter being on the right, and Venus in the southwest a few degrees lower. If the atmosphere be very clear and the eye of the observer keen, he can also see the red planet Mars within two or three degrees of Venus. In the lower latitudes much better observations can be made because of the larger angle which this part of the ecliptic makes with the horizon and consequently of the planets' increased altitude.

If the observer will watch until the other stars appear, he will see that Jupiter and Saturn are very near a group of stars which was mentioned in NATURE STUDY a year ago last month as the distinguishing group of the constellation Saggitarius. If the atmospheric conditions be very favorable the constellation Scorpio may also be discerned thirty degrees farther to the west and a few degrees nearer the horizon. The planet Uranus is in Scorpio but it will require a telescope to observe it. Under favorable conditions this planet shines as a star of the sixth magnitude, and can just be detected with the naked eye if the observer be skilled and knows just where to look.

The planet Neptune requires a telescope of at least eight inches aperture and with eye piece of highest magnifying power for detection, so it is evident that few persons ever have or ever can see this planet. It may be some satisfac-

tion, however, to know about where in the celestial sphere this remote planet is located at the present time. It has recently entered the constellation Gemini and may be found by those who have the requisite equipment about half way between the stars Eta and Mu. For the majority it will suffice to say that it is in the Milky Way nearly midway between Aldebaran and Pollux. It rises on the twelfth about half past nine, and is therefore well up from the horizon before midnight.

Mercury is the nearest to the sun of all the planets, and so near that it is difficult to obtain a view of it unless the atmospheric conditions be of the best. Its maximum elongation being only 27 degrees, it must usually be sought for not more than 15 degrees from the horizon. Let the observer take pencil and paper and draw a circle about two inches in diameter. Make a small black spot in the center to represent the sun and designate it by the letter *S*. The circle will represent the orbit of the planet Mercury around the sun. From *S* draw a line about three inches long and make a small black spot at its extremity, and letter it *E*. This line *ES* will represent the distance the earth is from the sun, and the black spot will represent it in one position in its orbit. Now draw a line from *E* so that it will just touch the circle but will not cut it if prolonged. Make a small black dot where this line and the circle touch each other and designate it by the letter *M*. This will represent the planet Mercury in one position in its orbit. The angle *MES* is called "Elongation," or if a circle be described from *E* as a center and radius *ES*, the arc *SM* is also called elongation, being an arc on the celestial sphere and containing the same number of degrees as the angle *MES*. It will readily be seen that if the planet be in any other position in its orbit the lines *EM* and *ES* make a smaller angle than at position *M*. On the other side of the line *ES* there would be a position corresponding to *M* where the angle

would be equal this one, but in all other positions the angle would be less. When the planet is at *M* it is at its greatest elongation and if the sun be on the horizon the planet would be somewhat less than 27 degrees above the horizon owing to the angle made by the latter with the ecliptic. As the planet cannot be seen until twilight comes on, as remarked above, search must be made for it usually at an altitude not greater than 20 degrees, generally considerably less than that.

Mercury reaches its maximum Eastern elongation on the eleventh, so that, if the observer keeps a careful watch from the 8th to the 15th soon after sunset between the west and southwest, not very far from Venus, he will doubtless get a glimpse of the smallest planet in the solar system and the only one that twinkles like one of the fixed stars.

If the observer is fortunate enough to possess or have access to, a telescope, or even a powerful field glass, he can see the four largest moons of Jupiter on every clear evening of this month except the 6th, 8th, 15th and 31st. On the first two of these evenings three satellites are visible and on the last two, only two can be seen. On the third evening all four are seen on the same side of the planet and in the order of their distances from their parent planet.

At present, Venus shows a gibbous phase like the moon between first quarter and full. On December 4 it reaches its maximum elongation, about 47 degrees, and will increase in brilliancy, as its elongation decreases, from that date until it reaches its maximum on or about January 9. From December 4 to the middle of February, when it reaches inferior conjunction, it will show the waning crescent phase like the moon between last quarter and new moon. It takes the largest telescopes, with high magnifying eye pieces to see the canals of Mars, and Mercury is a very unsatisfactory object in the telescope on account of its small size and low altitude. The rings of Saturn are a most in-

teresting sight in a telescope but it takes a good glass to reveal them.

Jupiter, Saturn and Venus wlll be conspicuous objects in the evening sky for a few months and the observer will have an opportunity to watch their change of position with regard to the other stars, an observation which early led to their being christened planets, i. e., wanderers. Jupiter will move nearer and nearer to Saturn until they are in conjunction on November 27, being at that time less than half a degree apart, when Jupiter passes Saturn and continues his journey eastward gradually increasing the distance between them.

As mentioned above, Venus is increasing its elongation, and moves faster than Jupiter, so that it will overtake the latter, or in astromomical phrase, is in conjunction with the planet Jupiter on November 17, being distant from him only a little more than two degrees, and the latter is then so near to Saturn, that Venus is also in conjunction with Saturn on the very next day, the 18th.

These three planets, in such close juxtaposition, form, perhaps, the most interesting celestial group of the year. It remains for the astrologers or the superstitious to warn people of the baneful or otherwise effects of this chance grouping of three planets, all pursuing an unswerving course around the sun in obedience to the grand law of attraction of gravitation.

Queer Ways of Walking. III.

BY EDWARD J. BURNHAM.

In his "Wilhelm Meister," Goethe, who was a great naturalist as well as a great philosopher and poet, satirically puts in the mouth of one of his characters a declamation against the study of nature. The dreadful charge is made that as one becomes absorbed in the contemplation of the beautiful and wonderful things around and above him, his interest in his fellowmen decreases, and, more dreadful still, he comes to look upon man as of less importance in the vast economies of the universe than is commonly assumed.

Goethe clearly perceived this tendency of nature study, and rejoiced in it. More than a century ago he saw that one who turned from study of the limitless spaces of the heavens or the infinite marvels revealed by the microscope, would view with but feeble interest the van that brought furniture next door, would fail to inquire why a neighbor had ceased to keep a carriage, and would care nothing at all about the fit of a stranger's coat. As for the other part of the complaint, Goethe believed that a knowledge of nature must inevitably lead to humility. Plainly the wildernesses of bloom where the foot of man rarely or never comes, the vast stretch of waters and the teeming depths of ocean could not be for man alone. We know now, better than the great poet-naturalist could know in his day, that while a correct understanding of nature does away with much that is vain in our egotism it also brings us a calm reassurance that may wonderfully strengthen a reasonable confidence in ourselves. We may be humbled as observation shows us how small, relatively, man's place in nature really is, but we may also reverently exult that he stands as the crowning type of the long line of development of forms of life upon the earth. The study of nature

helps us to a better apprehension of the true proportion of things, broadens the horizon of our thought, and helps us to a more intelligent reverence for the Creator and the laws that govern the works of His hand.

Happily there is less need now than formerly of demonstrating the value of nature study. That it does something more than merely keep children "out of mischief," that it helps wonderfully to develop the perceptive faculties, that it has a solid, practical, even a money value, if one must have it so, in fitting children for their life work, is now, to some extent, admitted. There are parents, uncles, aunts, teachers, everywhere who would gladly help the work along, but the question with them is how to begin. In the schools the answer is being gradually worked out; the text-books are being improved, and more schools are requiring that something shall be done in this direction. But with the curriculum already crowded, this work must be limited, and the problem still remains as to how it may be helped forward in the home.

The first step is to learn to make simple and easy use of objects near at hand. It was once generally assumed that objects of natural history, to be of interest, must be rare or from far away; but nature study teaches otherwise. It opens our eyes and awakens interest in countless objects at our very door. A good illustration is offered by the snails and their cousins, the slugs. They are almost everywhere. The slugs abound under boards and leaves in old city gardens as well as on mushrooms and other plants in the fields; land snails may be found in any grove of maple, beech or oak, beneath the leaves and rotten wood; fresh water snails of many kinds may be gathered in any quantity desired by dragging a dipper or net among the weeds and grasses in brooks and pools, or by dredging the mud at the margins of ponds. The land snails and slugs may be kept for a long time in a box filled with damp, decaying wood and leaves, the water snails in glass jars.

Much may be learned about these creatures with keen eyes alone—that in land snails the shells are usually flattened, but elongated in water snails; that the eyes of land snails and slugs are at the tips of the "feelers," while at their base in water snails; the breathing orifice may be found on the right side of the slugs and land snails, opening and closing slowly, and many water snails may be seen coming to the surface to breathe. But the most deeply interesting thing about them is the way they walk, or move along. If a slug or snail is placed on a piece of wet glass, we can turn the glass as we please, and watch the flowing, "creeping" movement of the foot, or "creeping disk." If we have a magnifying glass, so much the better. The water snails can be studied as they creep along the side of the jar, and, best of all, as they move along the surface of the water, making use of the under side of the same surface film that the water strider walks upon. Here, with a magnifier, the peculiar creeping movement can be seen to the very best advantage. If we are not too squeamish—and we shall not be when we realize what we are learning—we may moisten the back of the hand, or better still, the bare arm, and placing the slug or snail there may feel the "creeping" as the creature moves along. The sensation will never be forgotten, for in this experiment we have felt, as well as seen, the oldest way of walking in the world.

Many tiny creatures, as amœbæ, many bacteria and the single cells of some plants move about in water without feet, or fins, or any appendages whatever—merely by a "creeping" motion which is known as the "amœboid movement." This mode of motion has become highly specialized in the "foot" or "creeping disk" of the great multitude of snails, clams and other molluscs that still retain this first method of locomotion. But this thought is rather for grown-up folks than for children. For them, it will be enough, at present, to watch the slug move along the under side of a piece of glass, or the snail "walk" by help of the surface film that covers the water in the jar, although at the same time it will do them no harm to tell them that they are studying in that way the most old-fashioned of all the queer ways of walking.

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Seasonable Insect Studies.

BY CLARENCE MOORES WEED.

I. THE EVENING PRIMROSE BORER.

The dead and dry stems of the Evening Primrose may easily be found throughout the winter in most of the Northern States. They stand firmly erect, the hard, woody tissues easily withstand wind and storm. If you cut off one of these dried plants near the bottom, and then, carefully, split it open longitudinally, you will be quite likely to find a series of peculiar cell-like open spaces occupying the middle portion of the stem. Inside the outer woody layer is the central pith, the continuity of which is broken by these cell-like spaces. At each end of the space is a transverse septum, smooth and shining on the side toward the open space, and rough and irregular on the other side.

Lying in this clean cavity there is probably a slender, light yellow, sub-cylindrical larva, about one-third of an inch long. It is distinctly divided into segments, and has a small brown head, with three pairs of short legs, each terminating in a hooked claw, on the segments directly behind the head. On each of the segments, from the sixth to the ninth, there is a pair of short and peculiar pro-legs,

each having on its blunt end a circle of minute hooks curving away from the common center. On the under surface of the last segment are two semi-circles of a similar nature. Scattered over the general surface of each segment are a few reddish hairs, while on the sides of the segmemts are the small oval spiracles.

You will at once recognise that this larva is a borer which has developed by feeding upon the pith of the primrose stem. As it has fed it has made partitions at the end, by weaving its castings together with silk, keeping the inner surface smooth. When winter came on, it was half grown, and remained quietly within the shelter of the stem. Here it was dry and free from the attack of birds and predaceous insects.

In the spring these borers change to pupæ, to emerge, soon afterwards, as small moths. As there are two or three broods it is probable that these moths deposit their eggs in the stems of young plants.

This insect belongs to the family Tineidæ which includes so many families of leaf-miners. Technically, it is called *Laverna eloisella*.

In many of the cell spaces you are likely to find a different sort of larva. It is white rather than yellow, oblong rather than cylindrical, and footless rather than furnished with legs. This is the larva of a parasite. It has killed and eaten the Laverna larva. If you keep it carefully you may be able to see its change to a pupa, and later to an ichneumon fly of the genus Timpla.

II. THE EGG MASSES ON THE SHADE TREES.

During the fall and winter months one may frequently find upon the trunks and larger branches of elm and maple trees, whitish patches, easily visible some distance away, which, on closer examination, are found to consist of thin, gray cocoons, attached to the bark, partially covered with

large bunches of glistening white masses, suggestive of a dried frothy substance. When broken open these masses are seen to contain hundreds of small, white, spherical eggs, held together by the froth-like substance that permeates the whole mass. If the cocoon itself be pulled apart there will be found within it the empty brown pupa case, from which the moth has emerged.

These are the eggs and cocoons of the white marked tussock moth. Should you leave one of these egg masses in place and watch it in spring, you would see, sometime in May or early June, soon after the leaves develop, hundreds of tiny, hairy caterpillars come forth from the mass, and crawl along the bark toward the leaf bearing branches. When the latter are reached each caterpillar begins feeding upon the succulent green portions of the leaves. The young caterpillars are about one-sixth of an inch long, and are thickly covered on the back and sides with dark brown hairs.

At the end of a week from the time of hatching, the larvæ, as these caterpillars are often called, shed their skins, crawling out in a new covering previously formed beneath the old one. They continue feeding soon after this first moult, and a week or two later again shed their skins, to provide for their increase in size. After another period of feeding, a third moult takes place; the caterpillars by this time have become nearly an inch long, and are handsome creatures, yellow in general color, with brilliant, coral red markings.

About a week after the third moult a large proportion of the caterpillars desert the leaves and seek the rough bark of the trunk or larger branches where they spin loose, brownish, silken cocoons, within which they transform to the pupa or chrysalis stage. These are the caterpillars which are to develop into male moths. The other caterpillars remain upon the leaves, feeding freely, and undergoing one

or two more moults before spinning cocoons. They finally spin their cocoons in situations similar to those selected by the males, and change into brown chrysalids.

About a fortnight after the caterpillars pupate, they again transform and emerge as moths. The two sexes of these differ greatly: the males have wings, well developed feathery antennæ, and the front legs furnished with hair. The females are wingless, very different in appearance from the males. They cannot fly; after emerging from the pupa, each one crawls upon the top of the cocoon where she deposits her eggs in a single mass and soon dies.

In the most northern states there is usually but one brood of these tussock caterpillars each year. These mature about midsummer, spin cocoons, and late in July, or early in August, mature into moths. The eggs are at once deposited to remain unhatched until the following spring. Farther south there are two broods each season.

III. COLLECTING IN AUTUMN.

Late in autumn and especially early in spring, a great variety of insects may be taken under boards, sticks, stones and other things lying upon the surface of the ground. During the first warm days of the season, when the frost is barely out of the ground, a great variety of hibernating beetles, and some other insects may thus be found. For collecting small beetles especially, the method is excellent, as the tiny creatures congregate upon the dry, under surface of the board which may be turned over and examined at leisure. A vial of alcohol into which to drop the specimens, and a camel's hair brush to pick the small ones up with are needed in this work. A cyanide bottle and a pair of forceps are desirable for larger specimens and those that it is not desired to put in alcohol.

The hibernating adults are not the only insects to be

found in this collecting. The Cutworms and other larvæ will frequently be taken, so that many specimens to rear in breeding cages may be found. Occasionally, also, you will be likely to come upon a cocoon or chrysalis. It is worth while to indicate on each specimen the date, or in some way indicate that it was a hibernating insect, as the stage of hibernation will thus be fixed. This is often a matter of great economic importance.

This sort of collecting may be pursued to advantage throughout the season, although in summer fewer specimens are taken, especially in dry weather. The best time then to search the under side of boards is just after a day or two of wet weather.

Organotopic Plants. II.

BY FREDERICK W. BATCHELDER.

True parasites, as we have seen, steal the assimilated food material of their hosts. Their standing in the plant world is well established and there is little difficulty in classifying them or in naming those of any given region whose plant life has been investigated. The connection of parasite with host is direct and may easily be observed.

With the hemiparasites the case is different. The true relation of these plants to their hosts is obscured by various circumstances. They all have green leaves and many of them have brightly colored flowers. Besides this, there are many degrees of parasitism among them, some being more, some less dependent on the host. I cannot help suspecting, for instance, that the yellow Gerardias, (now separated by some systematists as the genus Dasystoma,) have gone farther on the downward road than the purple ones, for this reason: my herbarium specimens of the former, G. pedicularia, flava and quercifolia, have always turned "black as your shoe" in drying, while the purple ones, G. paupercula and tenuifolia, heve kept the colors both of the leaves and flowers as well as the average flowering plant. It is also to be noted that the yellow Gerardias turn black in the field long before the arrival of frost. This habit of turning black when drying appears to be characteristic of degenerate or decadent plants, a brand of servitude which they are pretty sure to find themselves, sooner or later, unable to hide. There is no doubt that critical studies of hemiparasitism in its various degrees will add many hitherto unsuspected members to the list of hemiparasitic flowering plants.

The study of saprophytism in flowering plants is practically a new one. Seed-bearing saprophytes have hitherto

been lumped with the parasites, and the status of hemisaprophytes is as yet ill defined. The former are supposed to live entirely, the latter partially "upon the debris of the vegetable world, deriving their nourishment from the organic matter resulting from its decay." Of course, the mushrooms are the typical saprophytes. They make no pretence of being anything else. The flowering saprophytes are not quite so honest. The only ones we are likely to see in this region are the coral-roots, if, indeed, they prove to be wholly saprophytic, a point which is not as yet definitely established. At any rate, these queer orchids come the nearest to being saprophytes of any of our local flowering plants. While their flowers continue to attain the high degree of specialization in the interest of cross-fertilization which characterizes the orchid family, the aspect of the plants is precisely that of root parasites. The plants are brownish or yellowish, sometimes tinged with purple; the leaves are mere scales and there are no breathing pores. Consequently "they are unable to elaborate the constituents needed for nutriment or to change carbonic acid from the air into assimilated food material." Then why not call them parasites? Simply because investigation has proved that they are independent of other plants, there being no organic connection between them and any living plants which might serve as hosts. We have three, possibly four, species of coral-root, (Corallorhiza.) I have collected in Manchester C. innata, odontorhiza and multiflora. The last named is abundant in rich, dry woods from July to September; of the second I have found but a single plant; the first grows in wet runs in woods, often partly immersed, and is the earliest of the genus, in dry seasons flowering as soon as the first of May, in wet seasons not developing until much later, sometimes not until well into June. C. innata has yellow stems with no trace of purple and the flowers have the sepals and petals yellowish and

the lip pure, unspotted white. The other two species have the lip spotted with purple. The stems of C. multiflora vary in color from quite clear yellow to a rather deep purple in different plants. I have noted that herbarium specimens of C. innata retain the yellow color in drying while the others are inclined to turn dusky or dark; a fact which may possibly indicate different degrees of saprophytism in the two species.

The few flowering plants in our area known or suspected to be hemisaprophytes are also members of the orchid family, a family which in some respects has attained the most perfect development in an upward direction, in other respects shows unmistakable signs of a downward tendency. Specialization has been carried to such an extreme as to defeat its own ends and to induce a counter-specialization of habit, for that is what all these "isms" we are considering amount to. In the struggle for existence certain species have found themselves so placed in relation to other plants that it has become easier for them to maintain their hold by becoming to a greater or less extent dependent on other plants or their remains. Now loss of independence means degeneration in the plant world just as much as it does in human life. As Professor Bailey says, "The more a plant depends on other plants, the more it tends still further to lose its independence." Very likely the coral-roots come of ancestors who were able to make chlorophyl and by means of it extract carbonic acid from the air; who were possessed of breathing pores, and who could produce normal leaves. But our present coral-roots have become almost, if not entirely, dependent plants, and other orchids, which still have the aspect of independent plants, betray in various ways a loss of independence. Among these latter are species of Calopogon, Pogonia and Habenaria, all of which genera are represented in the local flora. Some of these thrive best in deep shade, where

leaf-mold or humus is abundant; others are oftener found in the open, as in bogs and peaty meadows. Of the first genus named we have C. pulchellus (Limodorum tuberosum), one of the most beautiful of our orchids, sometimes called the grass pink. As the common name indicates, it simulates a grass, after a fashion, sending up from a round, solid bulb a scape with a single grass-like leaf. The handsome purple flowers are in a loose terminal spike, and the lip, instead of being, as in most orchids, turned downward by the twisting of the ovary, retains its original upright position.

Of the Pogonias, a most interesting genus, we are so fortunate as to possess three species. One of them, P. ophioglossoides, or adder-tongue Pogonia, is abundant in certain localities. The flowers are pinkish in hue and very delicately scented. Another, P. verticellata, whorled Pogonia, is found in at least three places in or near Manchester. It is one of the rarer species, and receives its common name from the fact that the leaves grow in a whorl of five at the summit of the stem. The flowers are inconspicuous, but very striking when closely examined, the three sepals being thread-like in form, sometimes two inches long, and dark purple in hue. Of the third species, P. pendula (trianthophora), I know of but one station, which I discovered several years since on the shore of Lake Winnipesaukee. It is the same locality where I found the root parasites named in my last article. [See October number of NATURE STUDY],

Of the third genus, Habenaria, we have several species, including the well-known purple-fringed orchids, H. fimbriata (grandiflora) and psychodes.

How many of the above-named orchids are partially saprophytic, and in what degree they are so, cannot at present be told. The field for study is a new one. Many observations, collections, comparisons and microscopical

examinations must be made before the status of each species as regards dependence can be determined. And it is not going to be easy to arrive at positive results even with the most searching investigation, for the problems of saprophytism are complicated by the intrusion of the problems of symbiotism. It has already been found that some saprophytes are also symbiots, and that the two conditions are more or less interdependent.

The undoubted symbiots will be considered in the next article.

An Autograph of An Earthquake.

BY WILLIAM H. HUSE.

Earthquakes have come and gone. Some, like most men, have made no record of their coming. Others have left their footprints on the rocks of time.

On a rocky hill a few hundred feet in altitude, a short distance north of Lake Massabesic in the town of Auburn, where the summit has been washed bare of all vegetation, there can be seen several narrow dikes of igneous rock. In one place the bending of the strata of the surrounding rock adds interest to the dikes, which otherwise have nothing to distinguish them. There is one dike a few inches in width, then a portion of the country rock a little wider. South of this is a wider dike, the southern side of which is concealed by vegetation. The peculiar bending of the strata of the gneiss at their ends tells the story of the condition of the archæan rock when the settling and bending occurred. The rock was solid enough to crack open but still somewhat

plastic. There was a twisting as well as a settling, and as the edges of the broken strata rubbed against each other they were bent and remained fixed as the chasm was filled with molten rock. They exist today as the interesting signature of the cracking and quaking that happened long ago.

From Darkness to Light.

The Story of a Lump of Coal.

BY SUSY C. FOGG.

The autumn days shorten and grow chill, but there is cheer within and we look forward not without hope to that season when we shall live by gathered stores and in thought, "count up what treasures we have garnered during the days of privilege."

The hard and jetty coal that laid upon the grate reddens and glows with such fervent energy is a product of centuries and no man saw. It is now a mineral without crystalline form, but believed to be of vegetable origin, of the kingdom which may supply fuel, shelter, food and clothing and its history is clean and thrilling.

The heart of the anthracite coal region is in central Pennsylvania, that "world of green hills" and greener valleys, where the winding river makes in and out, and it is enough to live, to enjoy the beauty, and be free from the soil and stain of the world. The surface is fair, like New Hampshire's own, but below, *there* is a different story. The quiet but tremendous forces which have been at work since time began have produced not the beautiful, gray granite, but strata on strata of hard, black coal, and the huge black "breakers" the "culm piles" and occasional desolate wastes where whole forests have been reduced to decaying stumps by water saturated with sulphur pumped from the

mines and left standing about the roots, are the marks of human endeavor and a mar to the natural beauty, yet no less fascinating to the fresh observer.

To walk the streets of a city where even the public buildings are undermined, and are propped by remaining columns of coal, to stand at the mouth of the shaft, as the loads of coal are brought forth into the sunlight for the first time in ages, and to run over rapidly its transformation is to be filled with awe.

Once upon a time in the carboniferous age, before these coal measures were formed, the earth was covered again and again by ferns and other simple plant organisms, possibly woods, and this vegetable matter consolidated through pressure and a slow process of oxidation under water or other covering sufficient to protect it from the air, and by frequent changes in earth levels. By experiment, it has been shown that of a large number of plants immersed in water for two years, the ferns, lycopodiums and pines had the greatest power to resist decay, and coal appears to be mainly composed of substances belonging to the same orders.

As coal, all former identity of plant life seems to be lost, and by analysis the substance is said to contain largely carbon with hydrogen, oxygen, nitrogen and some mineral matter as lime, iron pyrite and water.

No living thing was to witness this transformation, but without the result and its discovery, the world might stand still today for awhile. Perhaps the best estimate of which we are capable of the power of natural forces that have been at work can be made by the measure of mechanical means employed in the excavation of coal, for the forces of cohesion, adhesion and gravity, danger of combustion and flooding from water and difficulty of practical commercial transit have been overcome in a measure.

Electrical lighting and haulage will probably come into

general use in time, having been introduced with good success, but at present, is too expensive, and slower methods are employed, and here, even the labor of the much maligned mule is not despised. There is a good word for him printed in an account of a railroad put into operation in 1827:—"The whole transportation on it was done by gravity, the empty cars being returned to the mines by mules, the latter riding down with the coal but in their own car. The mules travelled from 35 to 45 miles per day, and so fond did they become of riding down hill that in one instance when the train was sent up without the mule-car the hands could not drive them down, and were under the necessity of drawing up the wagon for the animals to ride in. The mule is a sagacious beast and fond of natural scenery."

Similar methods are employed in all surface mining. At the surface strippings at Hazleton, there is a section of the Mammoth Seam about 25 feet thick. The surface earth and stones are scraped away by huge steam shovels, loaded into cars, and carried to the refuse heap. Gunpowder and dynamite, termed "roasters" by the miners, are used to loosen the coal, which is loaded on to cars aud drawn by mules or locomotives to the "breaker." This is a large one-sided building of wood, or sometimes of iron, with iron frame-timbers and sides of corrugated iron, and here the coal from strippings is dumped at the foot of the hoist. It is taken by a "conveyer" (a long chain of buckets) to the top of the breaker, several hundred feet, where it is crushed by steel-toothed rollers into various sizes, and passed by chutes where men and boys are kept busy sorting and picking out the slate.

Another method of sorting is this—the coal is passed down an inclined spiral, having several separate runways. The slate being heavier and not so smooth as the coal falls on the inner one next to the post, the "bone" usually falls next and the coal on the outside portion.

The coal next passes into a series of four or five screens and is "jigged" being washed at the same time.

The screens are of different sizes, from one comes the "Rice" coal, the "Rice" Nos. 1, 2 and Pea being very small. There is also "Buckwheat," "Chestnut," "Egg," (which is the most expensive and is commonly used in stoves,) "Furnace," etc. The huge lumps, uncrushed, are less expensive, and are used in ocean steamships and the like. The very small sizes cannot be used without increase of draught.

After crushing, screening and washing, the coal falls down the chutes into cars at the foot of the breaker.

Entrance may be made to the underground mine at Hazleton through a vertical shaft about 500 feet deep in which run two cages alternately, controlled by a mechanism that looks like large drums over which wire ropes wind, or by riding in cars down the slope which is an inclined plane of 30 degrees at first, 40 degrees below, and has a length of 1086 feet and a vertical depth of 540 feet. To one looking in at the mouth of the slope, the lamps carried by passengers going down appear only as retreating stars without power to penetrate the intense blackness. To those in the car there is total darkness until a dark but clean chamber is reached where huge pumps with a capacity for 30,000 gallons per hour are going constantly. Overhead, it is prettily decorated with fern and other fossils, which are found only in the shale and slate.

From the slope run gangways on either side, longitudinally with the seam or vein of coal, and from these are made openings, at regular intervals into the coal seam, which follow the dip of the rock and are called breasts. Through the gangways is laid a track, over which the coal is drawn by mules, and both gangways and breasts are heavily timbered to support the loose coal above.

Workings are pushed out at different levels from the

shaft in both directions, in order that the mine may work a number of veins at once.

The strippings at Lattimer are very extensive and cover hundreds of acres. The slopes here are steeper than at the Lehigh mine, as there is a greater dip of rock, but the lower vein is not so deep, so that the shafts are comparatively shallow.

The stripped rock at Lattimer shows large concretions of pyrite, called "man-killers" by the miners, because they often drop unexpectedly in excavating and cause death.

There is little or no trouble from "fire damp" at Hazleton, but more at Wilkesbarre, as those mines are older and deeper, some of the shafts being 1200 feet deep. Kerosene is too dangerous and smoky to be used in the miners' lamps, and sperm oil is used instead. When a fire is started in these mines it is very difficult to extinguish it, and the burning may go on fiercely for years. The heat and steam open fissures in the earth, which serve as chimneys, and the fire supplies its own draught.

Surely, a piece of coal is a wonderful thing, and all forces have combined to make it what it is and to place it in our hands.

The Ostrich Fern in Hollis.

Editor of "Nature Study."

A few days ago, while reading up numbers of NATURE STUDY in the Pepperell Library, I found the Ostrich Fern mentioned and a desire expressed for information as to where it could be found. I have been looking for it for some time, and at last have found one small bunch on our land.

While visiting in Northboro, Mass., in July, I was told

that it was to be found in one place in that town, but its exact location was kept secret. I came home with a renewed determination to find it if it was to be found here. Consequently sister and I hailed it with joy when we found it on our own land.

MINNIE A. COLBURN.

Hollis, N. H., October 8, 1901.

A Frog's Tidbit.

BY EDWARD J. BURNHAM.

In a meadow, where a rivulet joins a larger brook, a muskrat had its summer home. The careful farmer had mowed the banks so thoroughly that there was not a bush to shelter me. Accordingly I brought some alders from a distance, planted them in the earth, and hid myself in the artificial thicket.

It was a beautiful September afternoon. The muskrat, evidently the mother of a family and busied with household duties, hurried back and forth; some gnats danced in the sunshine; a dragonfly, one of the last of the year, flew lazily up and down the course of the stream; directly opposite, a green frog sat motionless, hidden and protected by the green grass. The muskrat had just returned with an apple from another foraging trip, muddying the brook in its clumsy haste, when the frog, with a little cry, such as it sometimes makes when escaping to the water from an approaching fisherman, leaped fully two feet in the air, straight at the passing dragonfly. It was a close call, but Æschna is quick of eye and strong of wing, and the frog sank back in the grass to swallow his disappointment, since he had nothing else to swallow.

For fully half an hour the frog sat perfectly motionless, seemingly indifferent to the dragonfly, which now flew at

a more prudent distance above him. Seeing the green-coated rascal sitting there demurely, no one would have dreamed that he had ever aspired to call a dragonfly his own. Then came a puddle butterfly and alighted on an alder branch, something more than a foot from the ground. It was a poor, bedraggled Colias, that evidently had seen better days; but a frog is never over particular, and this frog was hungry. So he slid gently down the bank and came across the brook with a single impulse, his long legs reaching far behind, the entire creature looking more like a fish than a frog. There was pity for the unsuspecting victim, and an impulse to interfere; but one must leave Nature's hungry, savage children to themselves if he would learn their ways. The frog came softly under the alder branch, leaped upward, this time without a cry, and swallowed the butterfly so quickly that one could not see it done. Then he splashed heavily into the water, swam leisurely back and resumed his station. Philosophical old frog! He had wasted no time in grieving over a disappointment, or in crying for that which was beyond his reach.

As I pitched my alders over the pasture fence and turned homeward, the frog was sitting demurely on the bank, the muskrat had just returned from another anxious foray, the dragonfly was circling gracefully about, and the gnats were dancing in the sunshine. All Nature seemed unconscious that a butterfly had disappeared.

Our Exchange Table.

In the October *Fern Bulletin* Alvah A. Eaton of Seabrook continues his interesting studies of the genus Equisetum, the present paper being devoted to E. litorale Kuhl.

The *Fern Bulletin*, with its next number, enters upon

the tenth year of its existence. It is an unusual and perhaps unprecedented thing that a journal devoted to a single family of plants should continue uninterrupted publication for a decade. This the *Fern Bulletin* is certain to do, and in enlarged and greatly improved form.

December *Bird Lore* is certain to be of unusual interest. Frank M. Chapman will begin a series of papers, to continue throughout the year, on "How to Name the Birds," and among other interesting features will be an article by Ernest Seton-Thompson on "The Recognition Marks of Birds," with figures of eighteen species of hawks and owls.

In *Entomological News* for October Mrs. Annie Trumbull Slosson completes her account of "A Successful Failure," being the story, told in her characteristic style, of her entomological experience in Florida during an unfavorable season; the letters from Thomas Say to John F. Melsheimer, edited by W. J. Fox, are continued; H. H. Newcomb gives an account of an entomological and botanical trip up Mt. Katahdin, resulting in the discovery of a new species of Chinobas; and the series of "Contributions to the Odonata of Maine," by the late F. L. Harvey of Orono, is continued. The frontispiece to this number is a portrait of Louis Schneider, the well-known entomologist, botanist and successful business man, who died in Philadelphia a few weeks ago.

The *Asa Gray Bulletin* was established as the organ of the Asa Gray Chapter of the Agassiz Association—a small but earnest body of amateur students who issued a small and unpretentious magazine. There was at first no thought of a subscription list beyond the Chapter membership, and hence the edition of the first number was very limited. The *Bulletin* continued to grow in scope and importance, however, for eight years, when it was absorbed by the *Plant World*. The first number of Volume I. was long ago exhausted, and *Plant World* proposes to reprint it, if the response to postal cards sent out shall warrant the expense. The net proceeds of the sale will be turned over to the families of the late editors, Gilbert A. Hicks and Thomas A. Williams.

NEST OF PHOEBE BUILT ON CLOTHES LINE.

Presented to the Institute by James O. Harriman. See "An Acrobatic Phoebe," p. 101

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An Acrobatic Phœbe.

BY WILLIAM H. HUSE.

It was an original little phœbe that set up housekeeping one day in spring. Whether all of the originality belonged to her or not neither history nor tradition tells. Her mate might also have been eccentric; but of that we are ignorant. Were the nuptials of a new and original style that set the feathered gossips agog with curiosity and noisy with tattling? Concerning this the society columns are all silent. This much is known—that Madame Phœbe would have her house in a romantic place. Perhaps this was all there was to it—she was a trifle romantic; but then romance is originality with most people, in their own feathers or borrowed—I mean stolen.

Madame was attached to the place and would have her own way. This last is another sign of originality. It is possible that there were no ordinarily suitable places in this particular yard where a nest could be built and be safe from cats. Of this we have no information. She has never told. This only is known, that she had become charmed with a clothesline that swung to and fro in the breeze and had almost lulled her to sleep as she perched upon it and dreamed day dreams of the time when she would brood her

little alabaster eggs into life and feel the joys of motherhood.

There was an old cloth, nearly black, once a piece of a garment, that hung over the line and slowly waved in the wind. Just why Madame Phœbe should select this old cloth on which to build a nest I cannot tell. I simply know that she was original and would listen to no remonstrances from her lord and master or advice from the neighbors. So here the nest was begun.

The first mouthful of mud was stuck upon the cloth near the top. A little moss was added, and then some more mud. Then it all fell to the ground, for the cloth was perpendicular. More than once the house fell down, and the persistent little builders had to learn by experience that a part of the foundation must hang over the other side, like a saddle. When that fact was learned, after much inspection and study, I suspect that Madame had to raise several more feathers to accommodate the increased size of her head.

The building of the nest went on. It was largely an experiment, for it was something new. Although the foundation was made like a saddle, it was a sort of a side-saddle. Madame was not so advanced as to do anything savoring of immodesty. Besides, she had not forgotten the traditions of the family, which for countless generations had built their homes upon shelves, wooden or rocky. Most of the lower part of the nest was on one side. Only enough projected over the other side to hold the nest on. The nest itself was perched above the rope, mostly on the side with the shorter limb of the saddle. The heavier side tipped the whole structure a little, but the weight of a bird in the nest made it horizontal. How the birds learned to preserve the balance of the nest as it grew in size is a difficult problem to solve. It argues for a considerable exercise of intelligence in their little pates. A history in de-

tail of the many experiments and failures and final triumph in the completed nest, perched upon the clothesline like an acrobat, would be an instructive study. At last the nest was finished and was a model of bird architecture. The delicate green of the moss, mingled with the neutral shades of the mud, made it a thing of beauty as well as a curiosity.

Bryant has charmed us with his description of the bobolink,

> "Merrily swinging on briar and weed,
> Near to the nest of his little dame."

but here the little dame herself swung to and fro in the summer's breeze as she performed the duties of motherhood. There must have been an element of romance in her nature.

Madame Phœbe is gone now and whether she will build like that again, or whether her progeny will try to be original and do something strange, the future only will tell. The nest remains behind to relate the story of the summer's experience and is now in the museum of the Institute.

The Ostrich Fern at Deering.

BY SUSY C. FOGG.

We were pleased to read in the November issue of NATURE STUDY the communication in regard to the discovery of the Ostrich fern at Hollis, N. H., and it recalled the pleasure of a similar experience in finding a small station of the same fern at East Deering, about twenty miles distant from Manchester by carriage drive.

This tall and handsome species was growing in a charming bit of pasture land, in a spot well watered by a spring, which nowhere gathered into pools, but filtered through the soil over an area distinctly marked by a more luxuriant growth, and greener, possibly sweeter, grass, as the

little white reindeer found it to be on the "sun side of the rock."

My desire to have the new form of fern life to grace a city garden, and my attempt to uproot it in any mass, proved nearly futile, but I finally succeeded in extricating a few pieces of the stout, braided root-stalk, so bare and torn of rootlets that I felt sure it would never thrive again.

But in spite of doubt, and on account of love, some things do grow, and so did the Ostrich fern in our "wild garden," slowly but constantly gaining ground, until, from three or four points on the creeping stalk there appeared tufts of sterile leaves, though no fertile ones were produced for years after its transplantation, and never in abundance.

Every spring we watch the graceful stems come forth and the pinnæ unroll their tight little spirals from the midrib outward, a process requiring days before the fern can hold its head erect and tower above its companions, and we rejoice that the miracle of beauty is being wrought again under our own eaves, as when this noble fern flourished in the old Deering pasture, surrounded by God's pure air and open country where the birds sang and the sheep played over the wall.

Organotopic Plants. III.

BY FREDERICK W. BATCHELDER.

A true parasite draws its nourishment wholly from the plant to which it has attached itself, giving no return except the ungrateful one of injuring or killing its host. A true saprophyte is supposed to live wholly upon humus or decayed vegetable matter. A true symbiot is a plant which has formed a partnership with another plant or plants; a partnership of such a nature that the benefits are mutual. Now it so happens that there is a striking resemblance in habit between certain members of these three classes of organotopic or dependent plants. Certain root-parasites, certain saprophytes, and certain symbiots are, in fact, so similar in appearance that it is not strange they have until lately been placed in the same category. Superficially, beech drops and coral root and Indian pipe appear to be nearly identical in habit. It has remained for that little detective, the microscope, to demonstrate that they are entirely different in their relations to the plant world and in their mode of obtaining subsistence. The first, beech drops, is a true parasite, and, like the lower fungi, subsists entirely upon its host; the second, coral-root, so far as present knowledge goes, lives, like the fleshy fungi, on decayed vegetable matter, and may therefore be considered a true saprophyte; the third, Indian pipe, until recently regarded as truly parasitic in its mode of living, has been proved to be a true symbiot. If parasitic at all, Indian pipe should be a root-parasite, but it has been proved that its roots have no connection whatever with the roots of other plants. Careful investigation has also shown conclusively that it does not subsist on decomposed vegetable matter; therefore, it cannot be a saprophyte. How then does it beg, borrow or steal its nourishment? It has been demonstrated that In-

dian pipe is a true symbiot, "being in its existence closely bound up with that of another plant which contributes to its necessities, but is equally benefited by this connection." The late Dr. Charles Mohr in the "Plant Life of Alabama" (government publication) states the relation as follows: "immediately after their germination the rootlets of these plants are infested by the vegetative threads or spawn (mycelium) of a fungus, which, as the plant develops, fastens itself upon every root, finally enveloping the rootstalk in a thick film, the higher plant drawing its nourishment solely from the elaborated food of the fungus." Whether the fungus gains anything more than a favorable site for growth is a question. It may possibly receive strengthening juices from the hospitable root. [R. Y. Leavitt, in *American Gardening*, p. 552.]

So here we have a very curious state of affairs. A flowering plant, belonging to the highest sub-kingdom in the world, has formed a partnership with a member of the lowest sub-kingdom! It has sold its birthright, the right to make chlorophyll and thereby assimilate its own food from the soil and the air, for a mess of pottage, and has thus enslaved itself to the lowest of the low. In their inflorescence and mode of reproduction Indian pipe (Monotropa) and false beech-drops (Hypopitys) are closely allied to the heath family (Ericaceæ). It is now known that many members of this family are to a greater or less degree dependent on the association of fungi with their root systems, the fungi taking the place of root hairs. Therefore, it is highly probable that the members of the Indian pipe family are degraded members of the heath family, having carried their borrowing propensity to extremes. It appears that the root system in their case is wholly enveloped, and that all the materials of subsistence are contributed by the fungus.

Both Indian pipe and false beech-drops may be found in

this vicinity, the former in almost any wood where leaf mold abounds, the latter usually under oak trees in rather dry woods. The white scapes and single nodding flowers of the Indian pipe are familiar to every one—the brownish, several-flowered scapes of the false beech-drops are less frequently seen.

As noted above, these two genera, Monotropa and Hypopitys, represent the extreme of symbiotism in flowering plants. But the inference must not be drawn that all plants which have their root systems infested with fungi are necessarily decadent. The fact is, almost all forest plants, whether trees, shrubs or herbs, receive more or less nourishment from humus, or vegetable mold, and are accordingly partial saprophytes. Many of them also receive the assistance of fungi, and are accordingly partial symbiots. Four large families of plants are now known to derive such assistance in the work of absorption. They are the pine, oak, birch and heath families. In them the work normally performed by root hairs is largely done by fungus hyphæ and strands. These not only partially envelop the root, but they also force themselves in between the cells of the tissue. A root thus infested has been called a fungus-root or mykorhiza.

It is evident that the story of the dependent plants thus far is a story of greater or less degradation. Even before the true status of parasites was known the decadent tendency was recognized and such plants were supposed to be degenerate outgrowths from their hosts. A remarkable thing about dependent plants is that they lose entirely the external appearance of a vascular plant and even the whole structure of tissues characteristic of vascular plants, and yet retain unchanged the parts concerned in reproduction. A single organ, or parts of organs, may indicate the downward tendency more positively than the rest of the plant. The haustoria by which parasites attach themselves to and

draw nourishment from other plants are degraded roots. In hemiparasites some divisions of the root remain normal while others are degraded into haustoria. In bastard toad-flax (Comandra) the roots produce globular haustoria which emit a process that penetrates the tissues of the host. It seems that degradation affects the vegetative much more quickly than the reproductive organs of plants; a fact of which the orchid family perhaps offers the best illustration. The coral-roots constitute a case in point.

The artificial divisions of the organotopic plants into the five groups, viz., epiphytes, parasites, saprophytes, symbiots and insectivorous plants, is a matter of convenience, and does not hold good except in extreme cases. There is an overlapping and an underlying and an inter-dependence of the several groups which is no less intricate than the root systems of the plants in a forest. So it must be borne in mind that the same plant may be a member of two or more of these groups; that between the saprophytes and symbiots the relation is extremely close; and that a great many forest plants are to some extent organotopic or dependent plants.

There remain to be considered the insectivorous plants, and also a specially interesting hemisaprophyte,

Queer Ways of Walking. IV.

BY EDWARD J. BURNHAM.

Aversion to snakes is in some degree instinctive, but to a much greater extent is due to prejudice and ignorance of the creatures and their ways. When we come to appreciate their usefulness in the destruction of vermin, we shall leave the harmless ones to themselves, and when we understand how restricted they are in their range of capacities and to what dangers they are constantly exposed, we may even come to have a sort of pity for them.

The little "chip" snake, the green and the striped snakes, and, indeed, the black snake and the adders also, mean us no harm when they raise their heads and show their long, forked tongues. They are not even making faces at us, but are merely trying to feel their way in what is for them a rather dark and very uncertain world. The snakes are at a disadvantage in the matter of eyesight, as well as in their way of walking, which we will learn something about further on. The skin or membrane that is stretched permanently over the eye in the place of movable eyelids, and which gives to all snakes a fixed, glassy stare, shuts out considerable light, and, as his eye is none of the best anyway, the poor snake is half blind as compared with the keen-eyed birds and boys that are his deadly enemies. So the poor snake, when not alarmed, goes slowly about, feeling his way with his tongue, and we mistake an infirmity for a matter of temperament or character—a very common mistake in the world.

There is much that is interesting about snakes, and as the boys will be sure to ask many questions, it is well to be able to answer some of them. Besides, we may find ourselves becoming interested, notwithstanding our prejudices, and shall thus add another to our list of objects to be observed and studied in our rambles. The tongue, as already hinted, is peculiarly useful to the snake as an organ of touch. It is forked, so as to be twice as effective as it would be if it ended in a single point. It is long and the branches are so delicate that they must never be permitted to become dry. So the snake has a sheath in which it rests when not in use and to which it can be swiftly withdrawn for moistening when it is in use. So we see why the snake, when awake, is almost constantly darting out his tongue and as quickly drawing it in again.

The scales that cover the snake's body are also worthy of careful study. In some snakes they are smooth and

flat, while in others each scale has a ridge or keel along the middle lengthwise. The number of scales and the presence or absence of ridges upon them are useful to the naturalist in describing the snakes and in determining the genera and species. The ridges are also of great use to the snake himself, for they help him to change his skin, when it becomes too tight for him. As the new skin forms beneath the old, the ridges on the new scales lift up and loosen the old skin, so that the snake is at last able to work his way out of it. In those snakes having smooth scales, countless fine hairs grow beneath the old skin and loosen it in the same way as do the ridges or keels. These fine hairs give the snake a beautiful glossy appearance when he has first shed his skin, but they soon die and fall off, having served the only purpose for which they grew.

There are many things about the snakes of great interest, but none more so than its mode of walking, and none that is more generally misunderstood. There is a popular notion that a snake can run very swiftly and for a great length of time, but it is a mistake. The speed of a snake is never great, as compared with that of most quadrupeds, and such speed as he has can be maintained only for a short distance and at a great expenditure of energy. As a consequence, land snakes, like other land reptiles, rarely wander far from home. Unless compelled to extra effort by lack of food, they live in the same locality year after year, and die there at last. A snake has from 120 to more than 200 feet and four times as many muscles that he uses in walking; also, by reason of his peculiar motion, he drags his body over about twice the distance that he actually gets ahead. Hence, walking is, for a snake, a tiresome and costly exercise; it uses up his energy very fast. Every boy who has chased a snake over open ground knows how easy it is to come up with him.

What we have called a snake's feet are plates on the under side of the body. Those beneath the body proper are single, each plate reaching across the entire width of the belly, and are called "belly plates"—gastrosteges, if the children want to learn a big word; those beneath the tail are in pairs and are called "tail plates," or urosteges. These plates are movable, and the hind edge is admirably fitted for catching hold of or pressing against any object that is firm enough to help the creature drag himself along. They may best be observed by holding a snake in the hand and letting him slide between the fingers. On a perfectly smooth surface, as a plate of glass, a snake is helpless. When a snake would change his position, he presses one end of a belly plate—it may be on the right or the left side of the body—against some object, as a blade of grass, a stick or stone, and begins to push. This contracts the joints of the body on one side and relaxes them on the other, causing the snake to move in a curve; then he will press a plate against some object on the other side, and this will give him a graceful curve in the opposite direction. As his body advances, he will make these curves at his own convenience or in accordance with the inequalities of the surface over which he glides. It is a graceful mode of motion, but with marked disadvantages, one of the most serious of which is the inability to take a step backward. No matter what danger he may find himself in, he cannot back out. He must either lie perfectly still or turn completely upon himself, with great probability that he will be observed, caught up and eaten.

The ability to take a backward step is a very important matter, and is closely associated with brain development. It implies some capacity to form a judgment, to weigh the chances, and to choose between two courses. Hence we find it most marked in man's unrestricted movements in all directions, in the powerful muscles of the

horse, which enable it to push backward a load nearly as heavy as that which it can draw forward, and the poise of the bird, with one foot uplifted, listening intently, forming a judgment from the sights and sounds about it, and deciding whether to step forward, to retreat gracefully backward, or to take wing. In striking contrast is the helpless situation of the clam when he has pushed himself into trouble. The snail can turn slowly about, but is incapable of moving backward. The snake, too, however urgent the occasion, must turn upon himself if he would move in an opposite direction. There is much that is suggestive in this relation between brain development and the power to use the reasoning faculties which is associated with the ability to step backward as well as forward; but this is perhaps rather too much for the children. What they will take delight in, is to study the habits of all sorts of creatures, and, among many other interesting things, learn what they may about queer ways of walking.

A Revised Creed.

BY FREDERICK W. BATCHELDER.

These are the days of creed revision. Orthodox and heterodox are hard at work trying to square old formulas with new facts. Therefore it can be no crime to change the reading of certain articles in the bird lovers' hitherto accepted confession of faith. Prominent among the thirty-nine,—more or less,—of these articles is this: "I believe the English sparrow to be the offspring of the Evil One, irredeemably bad by nature and an unmitigated nuisance to mankind." The general acceptance of this clause in the creed has naturally given the bird a bad name, and when a bird or dog has acquired a bad name he may as well be hanged and done with it.

The first question which arises when "credo," (which

means "I swallow whole") is for the time being supplanted by "dubito," (which means "I wonder if that's really so?") is this: IS IT TRUE? Then follow the processes of sifting the evidence, assorting the facts, multiplying observations, eliminating prejudice, allowing for the personal equation, and all those things which the modern and scientific method deems essential to the establishment of each and every article of its creed. So the bird lovers' creed must suffer analysis, destructive, if need be, in the interest of truth; for the scientific man insists that facts, thoughts and words must correspond.

At the outset I shall confess that I said "Amen" heartily to the sparrow article of the aforesaid creed for many years. I had up to a certain time been unable to discover that these birds were possessed of any merits whatever. I thought their songs unmusical, their voices harsh, their flight awkward, their manners offensive, their dispositions cruel, their habits injurious to man. A series of rude but pleasing shocks effected a complete conversion.

A little party of us were out one day on birds and flowers intent. It was in May, when the air resounds with sweetest lays. The oriole and the grosbeak and the linnet were singing their most passionate love songs. Nest building was at its height. Native sparrows and warblers flitted industriously about field and grove, lightening their labors with music's charm. As we approached a dense hedge of arbor vitæ our attention was arrested by an unusually sweet, low twittering which proceeded from some flock concealed in it. We agreed we had never heard the goldfinches warble so charmingly and attributed the unwonted excellence of their performance to the springtime ecstacy of love. With the utmost caution we crept nearer to them, all the while listening intently so as not to lose a note of that rare symphony. At length we startled them and they flew off. They were—English sparrows! So shock number one

proved that their voices might on occasion be not only agreeable but delightful in quality.

A month later, in leafy June, we walked through broad meadows when the morning sun turned each dewdrop to a diamond. A field of timothy sent up its tall, cylindrical spikes a few rods off at our left. There was still enough of morning mist hanging in the air to soften the picture and give everything the charm of quavering indefiniteness. Hovering over the grass-tops was a flock of birds, which seemed to be executing some sort of rhythmic dance, moving in unison with the precision of a "corps de ballet." They would rise and fall together. At times they would remain motionless except for a quick vibration of the wings, a vibration so quick as to make them invisible, like those of the humming bird when he sips nectar from the lily. They passed through varied and apparently systematic evolutions, every movement the embodiment of grace. We watched them a long time, wondering what manner of birds they might be, until our curiosity could wait no longer, and we drew near them. Away they went, with clumsy and labored flight, "squack, squack—cheel-yup, cheel-yup." We had again been taken in and done for by our old enemy, Passer domesticus!

Here is a problem, on which the opposing advocates of degeneration and universal progress may exercise their wits. Were these sparrows unconsciously rehearsing evolutions through which their remote ancestors had been accustomed to go before their characters had become modified by semi-domestication? Or were they, on the contrary, as unconsciously following certain innate aspirations after a more symmetrical development, so that, in the course of time, they may be able to vie, in beauty, grace and song, with the most highly gifted of their kind? For my part, I give them the benefit of the doubt.

These experiences showed us that the sparrows in ques-

tion do, at times, sing agreeably and that they are capable of graceful motion. Observations at home have verified these points beyond question. There is scarcely a resident or passing bird whose notes or manner of flight have not sometime been suggested by certain notes or movements of the "unmitigated."

Next, as to their manners. Of these we have had unusually advantageous means of observation. In the lawn, quite near the house, is a faucet that controls running water. At the side of it, we have scooped out a little pool, lining the bottom of it with pebbles and pond sand. The birds evidently consider this equivalent to a natural spring of water and use it throughout the season as a bathing resort as well as drinking fountain. To this little pool they troop from early morn till dewy eve. Sometimes we have neglected to turn the water on after temporarily shutting it off. Then there is a great commotion among our feathered friends. They perch on tree and bush and shout for us to "turn on that water quick!" And we always do, if we have to get out of bed hours before breakfast time for the purpose. When the water is once running the clatter ceases and as soon as we are indoors down flutter the birds, robins, song sparrows, yellow birds, anything and everything, including the "unmitigated." Then what happens? Terrible contests and the precipitate flight of all but the wicked imps? Not a bit of it! Some of the finest exhibitions of patience and courtesy imaginable, often such as to put to shame Us, two legged lords of creation! Not more than three or four have room to bathe at the same time, so certain ones take the first chance, dip and splash, then fly up into an overhanging bush to dry and preen. Then another lot will replace them and so the fun goes on. Occasionally there will alight an ill-natured bird, sometimes of one species, sometimes of another, who will attempt to appropriate the whole establishment to his personal use. Our

minds were all made up, when we began our observations, that the English sparrows would commonly be the aggressors and that we should have to defend the poor native birds from their ferocious onsets. This we have very rarely been called upon to do. On the other hand, certain birds of other species have given exhibitions of temper and of selfishness far in excess of anything the sparrows have shown. The chipping sparrow is spunky, but not ugly. He will fight for his own, but he will be fair with others. The bird which has carried off the palm for greediness and selfishness is, could you believe it, no other than dear, gentle, sweet, lovable robin-redbreast! We have come almost to dislike him, after seeing him, year after year, drive everything else away from the pool and crouch down in it by the quarter hour at a time, as if for the special purpose of annoying the rest. And he is selfish even among his own kind, driving away another robin vigorously unless the new comer happens to be a bit the stronger, and drives him away instead! So the robin has proved to be extremely ill mannered, and the English sparrow at least as well mannered as the average bird.

It is a pity that Passer domesticus should have to be known as the "English" sparrow. He is no more English than he is Irish or French or Russian or Asiatic. It is not impossible that Anglophobia may be to some degree responsible for his ill reputation. "What's in a name?" O! volumes of prejudice may be embodied in seven letters artfully put together!

In conclusion. The "unmitigated" is, beyond question, a most interesting bird. He is imitative and inquisitive. He can be made to sing admirably in confinement. As to his inquisitiveness, we have had very amusing illustrations of that. To our tall European birch there have come for several years, in spring and fall, one or more sapsuckers. They have bored hundreds of holes in the bark, and in fact

nearly girdled the tree. Their movements have caused great excitment amongst the sparrows, who have gathered in numbers on the branches to watch operations. Evidently, they were impressed with the idea that the sapsuckers got something that they themselves didn't get, and they were bound to find out what it was. By and by some of them would perch very near the feaster and "squack" at him, as if to say, "what yer got there?" Receiving no reply, they would try to alight on the bark, usually without success, their claws not being adapted to clinging to so smooth a surface nor their tails for bracing themselves against the trunk. Occasionally, however, some of the holes would be so near a branch, that they could reach it with their bills. Then they would dip in as deep as they could, to get at that sweet morsel within. Apparently, they did not derive much satisfaction so far as feeding was concerned, but I think they experienced the joy of endeavor, if nothing more.

In regard to the usefulness of the English sparrow, I will leave that question to the Department of Agriculture. The question of their extermination, I will commend to philanthropists, deprecating, by the way, the custom of encouraging small boys to assist in the slaughter. My contention is simply that the misdeeds of Passer domesticus have been grossly exaggerated and he has been the victim of an unreasoning prejudice. Accordingly, I would revise my creed about him, so that it will read something in this fashion: "I believe the so-called English sparrow to be an interesting member of the sparrow family; that he has a right to live, and that he is a nuisance only in localities where he has been permitted to increase to overwhelming numbers. I further believe that his undue increase may be prevented by merciful methods, and that in the course of time he will encounter natural checks to overbreeding,

and become a reputable and beloved member of the community."

Here endeth the first lesson.

A New Bird Book.

"Stories of Bird Life" is the truthful title of a neat little volume by T. Gilbert Pearson, Professor of Biology and Geology in the State Normal and Industrial College, Greensboro, N. C. The twenty chapters give entertaining accounts of the lives and habits of as many birds and groups of birds, told in a pleasing manner and with a careful regard for facts. There is no such nonsense as appeared in a book for children not very long ago, which, among other things, stated that the woodpecker, by tapping with his bill, found a hollow tree, and drilling through the outer wood, and found the place ready made for his nest.

Professor Pearson evidently loves birds, but does not weary us with a reiteration of a fact sufficiently obvious in itself, and he knows the birds that he writes about—has observed them carefully, and tells his stories at first hand. Moralizing and theorizing are purposely avoided, but the moral of each story is made plain by the story itself, and the inquisitive child will find plenty of questions suggested, with not a few hints of possible answers.

There are two appendices, one containing hints to teachers and pupils, and the other full descriptions of the birds referred to in the text. The book will prove a valuable aid to this department of nature study, both in the school and in the home. John L. Ridgway supervised the illustrations, and the volume is handsomely printed by the B. F. Johnson Publishing Company of Richmond, Va.

THE FRIENDLY CHIPMUNK.

Photographed from Life by Mr. E. H. Fogg.

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The Friendly Chipmunk.

BY EDWARD H. FOGG.

It was in the summer of '98, while sojourning about the shores of that beautiful sheet of water, called by the red men "The Smile of the Great Spirit," the writer had his first experience in making the intimate acquaintance of the striped squirrel (Tamias striatus), commonly known as the chipmunk. It was after many trials and failures that he succeeded in so far gaining the confidence of two, that they ate readily from his hand, placed on or near the ground. A third came occasionally, but the first two seemed to believe in the old saying that "two is company and three a crowd." Trouble usually ensued, the result being that numbers counted and the crowd was dispersed.

To those who know the peculiar sensation of holding a "wild" animal or bird in the hand, this article will appeal strongly, and to those who have not had that pleasure I would say that you can do it also, if you only go about it in the right manner. It has all the excitement of a game of chance, with the added charm of being out in the free air and sunshine. It requires some time and patience, for your advances must be very gradual. Chippy

has been taught by his parents that pretty nearly everything, including man, is his enemy. This having been emphasized by sundry narrow escapes from hawks and owls, being chased by cats and dogs and stoned by boys, it is small wonder that he looks on your apparent friendliness with suspicion. However, he has considerable curiosity, and if you "make haste slowly," you will doubtless succeed. Two or three little hints, gained by experience, may be of use to some. Avoid all sudden movements; extend the hand carefully and drop the contents to the ground—of course, when he is looking. Then move backwards slowly, and after a few trials he will investigate; when, with a little skill and judgment on your part, he will finally, if unable to reach what is in your hand otherwise, place his little feet on your hand to secure it. Now, if you move involuntarily, all will be lost, but if you remain motionless when you feel that little electric thrill, he will come again, and soon with the utmost abandon.

One day this fall, when the leaves were nearly gone from the trees, and the air had that peculiar "feel" of approaching winter, it was my good fortune to have another pleasant experience with the same species. My way took me along the lake shore, where I met a man who seemed much interested in the antics of a squirrel. On questioning him, I learned that he had fed the little fellow all summer, until at last he became so tame he would come at his call, climb all over him, going in and out of his pockets with apparent absolute fearlessness. Taking some nuts in my hand, it required very little coaxing to induce him to climb up and perch on my hand, meanwhile storing away the nuts in his pouches. Before doing this, however, he bit off some of the pointed end, for what reason I can only guess; possibly the sharp points did not feel comfortable against his cheeks. He would take four or five nuts at a time, scamper to his hole, which was at the base of a tree, and return quickly for more.

There were two entrances to his house, a front and back door, or, possibly, an emergency door, by which he could escape in case of invasion by foe or flood. He was exceedingly quick motioned, as evidenced by the picture, which was taken with a rapid lens, working at f–6, and this was the best result of several. It would be interesting to know

> "What he thought of me the while,
> Whether his feelings were of fear or no;
> But unless we are shrewd enough to guess,
> Be sure we'll never know."

Who can tell? It may be *the thing* in *Squirreltown* to do such *outre* things—that *he* has already told *his* hearers of *his* experiments with the big two-legged animal, and that he means to resume them. Be that as it may, I hope the brave little fellow is enjoying the *results* of our experiments, and that, safe from harm, we shall renew our acquaintance another season.

Good Words for the "Revised Creed."

Editor of "Nature Study:"

My sister is going to take your magazine, and I enclose her subscription.

I wanted to tell you how much I enjoyed the "Revised Creed," as I think English sparrows are much abused. I have watched them a great deal, and do not consider them any more quarrelsome than other birds. In fact, I have seen more quarrels among swallows and goldfinches, I think, in comparison with their number.

I was quite amused last spring by seeing a Summer yellowbird chase an English sparrow entirely away from a fir tree where it was feeding, and the sparrow did not make the least resistance. M. A. AYRES.

Medford, Mass.

Organotopic Plants. IV.

BY FREDERICK W. BATCHELDER.

One of the most remarkable phenomena in the natural world is the invasion of the animal kingdom by certain vegetables and of the vegetable kingdom by certain animals. There are animals of low organization which possess chlorophyll and are thereby enabled to live without feeding. Like plants, they decompose carbon dioxide and form starch in sunlight, and are so far trespassers into the animal kingdom. They may be called vegetating animals. On the other hand, there are plants of comparatively high organization which feed and digest like animals, and are so far trespassers into the animal kingdom. All the organotopic or dependent plants show a tendency in this direction, but the group now to be considered marks the extreme of deviation from the normal. These are the so-called insectivorous plants, better called carnivorous plants, since their diet is not restricted to members of the insect world. To the borrowing propensities of the other organotopic plants they have added the extraordinary habit of catching, eating and digesting animal food, thus increasing largely the supply of nitrogenous material at their command. The manner in which they accomplish this end, as well as the proportion of animal food to the total amount of food consumed, varies greatly in the different orders of plants concerned.

The plants of this group are not very familiar objects, being most abundant in localities which are difficult of access. They all inhabit bogs and marshes, for their habit of copious secretion demands abundance of water. The person who cares to study them in their natural habitat must brave wet meadows and tangly swamp and quaking bog. Occasionally when a road has been put through some such ground there may be found a few plants easy of

access. For instance, there is by the side of the road to the old pumping station, not far from Manchester Center, a wet, sandy spot covered with somewhat rare plants, one of which is Lycopodium inundatum, and another a sundew, Drosera intermedia. This is one of the carnivorous plants, and may be found in abundance, provided one knows where to look for it. Our other species, D. rotundifolia, though less abundant, is by no means rare. This genus, Drosera, is the most striking of our carnivorous plants, since the processes of entrapping, securing and eating their prey may be actually seen. The plants are small, with a slender scape a few inches high bearing several flowers, and a rosette of leaves at or near the ground. The scape is bent over upon itself near the upper extremity, and the one, two or three small, bright white flowers at the top of the bend open only in sunshine. The leaves and petioles are usually of a reddish hue, though in D. rotundifolia I have often found them green. In the last named species the leaves lie flat on the ground and are shaped like a small, shallow salt-spoon with a straight handle, the blade of the leaf corresponding to the bowl. In D. intermedia the leaves are raised above the ground and are inclined to slant upward. In shape they are like the handle of a child's toy spoon, broadest near the extremity.

But the most peculiar thing about these plants, and the most essential, as we shall see, to their well being, may be observed by the use of a pocket lens of moderate power. The leaf is beset all over the upper surface and around the edge with hairs or tentacles. At the end of each hair is a gland, and from each gland exudes a drop of viscid fluid like a drop of dew, whence the popular name, sundew. So the leaf looks like a tiny cushion stuck full of minute diamond-headed pins. A very innocent-looking plant it is. Blow on it as hard as you will, or shower it with water. Nothing will occur. The plant cares nothing for wind and

rain. But touch a leaf repeatedly with some solid substance. After a while it will begin to show signs of peculiar activity. The hair-like, gland-bearing tentacles receive some sort of an impulse which causes them to slowly bend inward, If a small solid object, like a bit of glass, is placed on a leaf, the tentacles will, in the course of a few hours, close in upon it and thus imprison it. Since the object is in this case insoluble, no digestion can take place, and after a while the tentacles resume their normal position. With a digestible object the case is different. The evidences of excitement are more marked. If a bit of meat is placed on the center of the disc, the tentacles are not only inflected towards and over it, but their glands pour forth an increased amount of the fluid secretion.

Now what happens when the proper prey of Drosera, a fly or beetle or other insect, comes along? The fly either alights on it as a resting place, or is attracted by the odor or by the glittering drops, perhaps by both. Darwin was quite sure certain insects he observed were led to the plants by the odor. The unsophisticated fly alights, at any rate. The next thing he knows, his legs are caught in the sticky diamonds and he cannot release himself. It is to the credit of Drosera that it does not prolong the agony of the poor fly through the gradual stages of imprisonment, else he would suffer all the horrors of long-drawn waiting for death, like some of those victims of mediæval cruelty depicted by Poe. Fortunately for the fly, the viscid secretion closes his tracheæ, and he experiences, very likely, a sort of euthanasia, like being drowned in nectar. The more he struggles, the sooner his relief comes, for in his struggles he touches more and more of the glands, a larger quantity of the secretion is poured forth, and thus he is drowned the quicker.

Sympathy for the fly being no longer uppermost in our thoughts, we may now follow the remains with equanimi-

ty. The fly is dead in about fifteen minutes. The tentacles, which began to bend inward the moment the fly alighted, continue to do so until his body is completely enclosed, sometimes even the edges of the leaf rolling inward, so that the blade assumes the form of a little cup. The tentacles remain clasped for a much longer time over objects which yield soluble nitrogen than those which do not, unfolding and resuming their normal positions after periods varying from one to seven days. At the end of this time what is left? Only the indigestible parts of the insect; the same, in fact, which would remain after it had been subjected to the process of digestion in the stomach of an animal! In the words of Darwin, "a plant of Drosera, with the edges of its leaves curled inwards, so as to form a temporary stomach, with the glands of the closely inflected tentacles pouring forth their acid secretion, which dissolves animal matter, afterwards to be absorbed, may be said to feed like an animal." So these remarkable plants not only have the power of absorbing matter already in solution, but they also have the power of rendering matter soluble, and, therefore, may properly be said to possess the power of digestion. This is one of the most wonderful facts in the physiology of plants.

There are in the northern United States five species of Drosera. One of these is found north of our area, and another west of it. Besides the two common species, D. rotundifolia and intermedia, there is found in New England one other, D. filiformia, thread-like sundew. This grows near the coast, according to the manuals, from eastern Massachusetts to Florida, but it should be expected and looked for in New Hampshire, as everything else similarly booked should be.

For those who are interested in the subject, there can be no more pleasurable pastime than the study of these plants in life. A lot of them may easily be taken home with a

sufficient quantity of their native soil to ensure continued life and growth. These then may be watched day after day for months, perhaps all winter, and their habits observed. Numberless experiments may be made with them. They may be fed or starved, and notes made of the differing results. Their digestive powers may be tested with all sorts of food. Records of the time of action under excitement of the various parts, and of their reaction after excitement, will be of special interest. Entomologists will find endless entertainment in observing the number and species of insects which come within the range of the plant's influence. It is not impossible, notwithstanding the long and patient researches of Darwin and others, that absolutely new discoveries may be made. A point which still needs investigation is the source of the motor-impulse which is transmitted through the glands to the tentacles and produces the subsequent motion of those parts. The action is apparently similar to nerve action in animals ; but as plants have no central organ, and therefore no proper reflex action, the similarity must rather be apparent than real.

A Squirrel's Dry-House.

BY EDWARD J. BURNHAM.

The squirrel has for so long been associated in the popular mind with nuts, that comparatively few people have ever reflected upon the many vicissitudes which must have driven him, at one time and another, to seek a greater variety of food. The squirrel has been pictured time out of mind with tail over back and a nut between his fore paws. In museums his stuffed skin is made to assume the conventional form, while countless books for children have pointed the moral to be found in his indefatigable industry

in storing nuts for winter use. Some squirrels certainly do make stores of nuts, and perhaps all do so to some extent in regions where the winter is severe; but it should be remembered that the squirrel is a southern animal in its origin, and whatever habits of prudent storage it has have been acquired through the hard experience of many generations.

There is every reason to believe that this habit of laying up a store of food for future needs, was not acquired by all the squirrels and at the same time. Squirrels, so far as the range of their limited powers extends, are more like human folk than we are apt to imagine. Here and there a squirrel, more intelligent and industrious than his neighbor, laid by a small store of nuts and by its help lived through a hard winter, while many of his less thrifty neighbors perished. Perhaps he got the idea from finding a few nuts that had fallen into the hollow of a tree. Gradually, such is the force of example, other squirrels would put the new idea in practice, until it would become a general, perhaps universal, custom in squirrel land.

But the squirrels did not rest content with a single achievement. They have their centuries of progress to look back upon and boast of, in their own narrow limits, just as human beings do. Squirrels are not naturally wanderers, and do not like to leave home. So, when the nut habit had been acquired, if, for some reason the nut supply should be short or fail altogether, the more enterprising squirrels would make experiments. Some of these experiments would prove successful, come to be adopted by other squirrels, and thus another habit would be acquired. It is well known that the woodpeckers in some parts of the country, have changed their habits to a considerable extent during the past twenty years, and there is no reason to doubt that the squirrels are doing the same. An incident, seeming to prove this, came under the writer's observation recently, and may be of interest to NATURE STUDY readers.

Several years ago, a tract of wild land from which the timber had been taken, was burned over, killing some poplars which had been left standing in a clump by themselves. These dead poplars were much sought by the woodpeckers, who built nests in them until the wood became so decayed as to render the old stubs unsafe. Many of these now lie prostrate, and the number of the fallen rapidly increases. In November, a stub which was nearly ready to fall, was pushed over, and being gently lowered to the ground, to prevent breaking, a section containing a woodpecker's nest was cut out and taken home for study. There were two holes, one eighteen inches above the other. The upper hole had been abandoned after being drilled some three inches horizontally; the lower excavation was complete. Upon removing the front, so as to expose the entire cavity, the woodpecker's nest of fine chips was found at the bottom, resting upon this, was a blue-bird's nest, and the remainder of the cavity was filled with mushrooms, in every stage of drying. The bark and thin wood on the opposite side of the tree from the entrance, had become cracked by the weather, and the narrow slit afforded excellent ventilation.

The cavity thus constituted a perfect dry-house for the storage of mushrooms. There was no appearance of a squirrel's nest, but that the storehouse belonged to a squirrel was shown by the fact that a tunnel had been gnawed upward nearly to the upper hole. A red squirrel will have, if possible, two doors to his dwelling. He does not intend to be caught in a hole if he can help it. Doubtless in this case the completion of the tunnel had been deferred because the mushrooms must be gathered while in good condition. There were thirty-seven mushrooms in the store, comprising five genera that could be positively determined. They were all gilled mushrooms, and all such as have been eaten at one stage or another by mush-

room enthusiasts. There was not a poisonous one in the collection, notwithstanding the fact that at least two poisonous species must have been growing where these were gathered. It may interest the student of mushrooms to know that the genera represented were Hypholoma—two species, incertum and perplexum; Armillaria, Clitocybe, Hygrophorus, and one of the Phalloideæ. Of this latter there were nine individuals, all in an early stage, indicating a preference for stinkhorns and a knowledge of the best time for gathering them.

The fact is well established that squirrels eat mushrooms. Chipmunks and reds were seen by competent observers making a meal of them at different times during the last summer; but it may be asserted with confidence that the storing of them is not a general practice in this section.

From boyhood I have examined squirrels' nests wherever found, and I have made a special study of woodpeckers' nests for several years, but never before observed mushrooms stored as in the present instance. The conclusion is inevitable, therefore, that this squirrel, living in a tract of woodland from which the trees that formerly supplied his store of nuts had been swept away, became an experimenter, and turned his attention to the possibilities of mushrooms as a convenient and nutritious substitute. He or some neighbor, has made a discovery which may prove of great importance to the squirrel tribe.

A Long Step Forward.

In the review of the world's progress at the close of the nineteenth century, to which so much attention has been given during the past two years, one line has either been overlooked entirely or has received much less consideration than it deserved, and that is the wonderful progress made in opening up to the general public, and particularly to the children, of what were for centuries held to be the secrets of nature—as if Nature had any secrets which she was unwilling to reveal. A century ago there was almost no attempt to bring the wonders of nature within the comprehension of any but the small number of professed naturalists; today the popular books on natural history would make a formidable library by themselves.

The change has been remarkable, but, like most movements which are to continue, it has been slow. It was also marked by some striking incongruities. It has been so difficult, until recently, to see that what is common and near at hand may be as wonderful as that which is rare or to be found only in distant parts of the world. Not many years ago a geography in use in New England schools contained pictures of the ostrich and the condor, while there was no suggestion that the eagle, the osprey and the heron might sometimes be seen from many a schoolhouse door. The story is told of Agassiz, that, upon his arrival in this country, he was shown through a printing house, where a work was in progress of which its projectors were very proud. His attention was called to the sheets but he passed on without comment. Later the work was again forced upon his attention, when he replied: "Yes, yes; I see. A book on natural history for American children. A picture of three butterflies—and not one of them ever found in America."

A Triumph for Science.

BY WALTER S. ABBOTT.

Had anyone said, ten years ago, that we should some day import a disease from South Africa to rid our fields of grasshoppers he would have been laughed at or called insane but when the scientist, the entomologist, and the scientific agriculturist work together, something is bound to happen, and this seemingly impossible deed has actually been done.

In 1899 and 1900 the plantations in the vicinity of Bolivar county, Mississippi, were overrun with a species of locust (Melanoplus differentialis) and great damage done. On one plantation, before the middle of July, three hundred acres of cotton and one hundred and fifty acres of corn had been entirely destroyed, the oat crop damaged fully fifty per cent, and the other crops badly injured.

The owners of the infested plantations applied to the Department of Agriculture, and a man was sent to see what could be done, and many plans were tried for the destruction of the invaders. The infested fields were plowed in the fall, thus exposing the eggs, which are laid just below the surface, to a degree of cold which would destroy many of them. The egg-beds were spread at time of hatching with a solution of kerosene, which, although expensive, was very effective. The ditches in some places were filled with water, and the surface covered with a film of oil, and then the insects were driven into them, by beating the surrounding herbage with brushes, and large numbers killed in this way. A mash of bran and arsenic was tried in some places, but with little success.

While all these plans were effective in a certain degree, they were very expensive, and it remained for science and the bacteriologists to save the fields. It had been noted

some time before that the locusts of South Africa were killed in great quantities by a certain fungus disease, and tubes of this fungus were secured and sent to the infested districts. The contents of these tubes were mixed with a little sugar and boiled water; then the favorite food of the grasshopper (cocklebur) was steeped in the liquid and fed to a large number of the insects captured for this purpose, and as soon as it was seen that they were infected they were released. Others were placed in specially prepared boxes, where they would come in contact with the spores of the fungus, and when infected were placed in the most badly infested spots. In some places, where the hoppers were very thick, a dilute solution of the fungus was spread over the ground and upon the leaves of the corn and cotton.

The month of June, when the experiment was tried, was very favorable to the spread of the disease, and the results were surprising. By July the dead grasshoppers were to be found in all parts of the plantation, as many as six being found on one stalk of cotton, but it was not until a month later that the full results of the disease could be seen. By August the diseased insects were to be found in quantities, and along the ditches almost every plant bore one to a dozen dead hoppers, and it was to be seen that from the infected areas the disease had spread even to the other plantations, and was steadily doing its deadly work.

In this vicinity was found another locust (Schistocera obscura) and many local species of grasshoppers, but these did not seem to be at all affected by the fungus, as all the dead specimens examined were found to be differentialis; so it is almost certain that only the destructive invaders were attacked by the disease.

Although at first it seems like taking a mean advantage of the grasshopper to thus destroy him by a disease brought

thousands of miles, we are really only hastening a little the work of nature, for sooner or later the balance would have been restored, the pendulum would have swung the other way, and the mighty tribe of Melanoplus differentialis would have been swept away almost in a breath, leaving only a few individuals to begin the work of rebuilding their tribe.

And so the struggle goes on, the insects growing stronger and stronger year after year, until Nature, sometimes assisted by man, as in this case, but generally alone, takes a hand and the mighty army vanishes and the fields are once more green.

Our Exchange Table.

Mrs. Annie Trumbull Slosson, perhaps best known to NATURE STUDY readers as the author of "Fishin' Jimmy," but known to naturalists everywhere as an indefatigable worker in the field of entomology, contributes to the January *Entomological News* a list of insects taken by her on Mt. Washington last summer, and not previously reported from that locality. Mrs. Slosson has reported similar lists each year since 1893, with the exception of 1900, when she was unable to make her customary visit to the summit. The present list includes 250 species, several of them, and at least one genus, being new to science.

In his "Recognition Marks of Birds," in *Bird-Lore* for November-December, Ernest Seton-Thompson neatly ilustrates an old truth by a new figure when he says of the recognition marks of hawks and owls that they are "to enable birds of each species to recognize their friends, just as soldiers are uniformed so that each may know his party." Of course, since Darwin, we have understood why the peculiar feature of any species is the most variable feature.

It is the latest to have been acquired, and is therefore the least definitely fixed. While a peculiar feature distinguishes a species, the variation of that feature helps to mark individuality. As the writer says: "They keep the same general style, but differ in detail with each individual, so that the birds can recognize each other personally, just as we do our friends, by peculiarity of feature."

This good bit of humor appeared in November *Torreya*:

The following statement, printed on a postal card, was received last month by members of the Linnæan Fern Chapter of the Agassiz Association. The appeal is self-explanatory, and as *Torreya* is not "in politics" just at present, we republish without comment:

Fellow Members:

Vote for Mr. Gilbert. There is no comparison between the two candidates for the presidency. Mr. Gilbert is a scientist, has a wide acquaintance with the members and the duties of the office. He lives near the center of fern lore. I am only a collector, have never attended a meeting and am a worldly business man. I have a daily newspaper to attend, and I am a politician. In truth, I am one of the possibilities for the Presidency of the United States upon the Populist ticket in 1904 against Theodore Roosevelt. It will give me all I can do to get the nomination for the office. I am much pleased for the honor so far and would be greatly pleased to make the Joliet park the headquarters for the American fern, but association should be continued along its present prosperous lines and its affairs should be considered far above the pleasure of any one individual. If possible I will attend the next meeting and if you like my looks I will stand for the race some other time. If any have already voted for me write quickly and have the vote changed. JAS. S. FERRISS,

October 17, 1901. Joliet, Ill.

THE ORCHARD ORIOLE'S NEST.

Photographed by Mr. E. H. Fogg.

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A Feathered Basket Weaver.

BY EDGAR D. CASS.

A brief visit to Connecticut this past season promised me an opportunity to become familiar with the yellow breasted chat. From the time I began the study of birds to the present moment I have felt more than a passing wish to behold in his native haunts this brilliant representative of the Warbler coterie. Fate, however, has thus far decreed otherwise, for a hunt high and low during the fortnight I was there, failed to disclose his presence.

Strangely enough, my desire for an acquaintance with the chat so absorbed my attention that I never thought of meeting the orchard oriole (Icterus spurious). Perhaps the secret charm that makes bird study so fascinating lies in the fact that we are constantly meeting the unexpected. You hunt for the yellow-breasted chat, in a locality that he ought to frequent, and failing in this, discover a family of orchard orioles within fifty feet of the veranda where you have been reading. At least, this was my experience.

The first morning after I arrived in Westbrook, I heard

a delightful bird song repeated again and again in the orchard back of the house, and sallying forth, opera-glass in hand, I proceeded to interview the little gentleman with the vireo-like voice. Chapman has well said that "Words cannot describe his song," but to me it possesses qualities that suggest the notes of the warbling vireo, though it is a much more pleasing melody.

One glance through the lenses showed that it was no vireo, and a more careful scrutiny told me that my new neighbor was an orchard oriole. Evidently he failed to reciprocate my feeling, for he left the cherry tree where he had been singing and hastily retreated into the top of an old sugar maple which stood a few rods away. There he remained, flitting about, peering down with his bright, bead-like eyes, and occasionally scolding in a low voice, as though talking to himself. These were the tactics which he followed with little variation whenever I attempted to observe him closely. From first to last he continued alert, timid, suspicious.

The female moved about like a shadow—stealing in and out of the nest so quietly that I seldom saw her, except when I frightened her away by a too close approach to the nest, which was built in the forked branch of a young apple tree, about ten feet from the ground. Judged by the standard of protective coloration, it was not wholly a success, for the straw-colored basket contrasted sufficiently with the green leaves to enable me to locate it without any difficulty. It should be noted, however, that the nest harmonized perfectly with the olive green and dull yellow of the female. The outside of the cup-shaped structure was composed entirely of grass blades, chosen with care and precision, and woven with a skill that deserves to rank this oriole high among his fellow artisans. Within this cleverly contrived basket—as may be seen in the accom-

panying plate—was placed a cup of felt, loosely woven and lined with horsehair, bits of down, a feather or two, etc.

It was not my good fortune to see the nest constructed, so I am unable to say whether the architectural skill should be credited to Madam Oriole or her spouse, but probably it should be shared between them, for during the process of incubation, as well as afterward, the male not only acted as sentinel but also shared with the female in the cares of the household. For some reason only one offspring was hatched. Whether the parents were successful in rearing him or not I am unable to say, for I continued my journey before the young one was large enough to leave the nest.

Another Friendly Squirrel.

Editor of "Nature Study:"

After reading Mr. Fogg's article in the January number of NATURE STUDY, I felt impelled to relate the story of a chipmunk of my acquaintance. His home was located about three or four feet from the piazza of Mr. C. R. Merrill's cottage on the shore of Lake Massabesic, and the beginning of our acquaintance with him was during our first visit to the cottage late in May of last year. He was evidently furnishing his home that day, and industriously collected dry oak leaves for that purpose. He would sometimes crowd three large leaves into his mouth in a most amusing fashion, and then scurry away to his home to deposit them.

A little later in the season, when the family went to the cottage to stay, Mr. T. H. Walker taught "Chippy" that he need have no fear of the inmates of the house, with whom he was an ever-welcome guest during the entire season. Mr. Walker began Chippy's lessons by prostrating himself on the ground, near the squirrel's hole, and giving him nuts. Chippy soon gained sufficient confidence to

take the nuts from his hand, then to run over his body and extract them from pockets or other places of concealment. I have seen him work his way with considerable perseverance into a closed hand, to obtain a nut which he knew was there. Gradually he was coaxed to visit the piazza, and even to venture inside the house. He would take food from any member of the party who would show a little patience in gaining his confidence.

I was sitting in a chair on the piazza one day, when he made several trips to my lap, jumped from my shoulder to a near-by hammock, in which a lady was reclining, ran across her chest to the piazza railing, and thence down to his home with his load of nuts. When the supply of nuts was exhausted he did not disdain oats, a goodly quantity of which he stored away in his larder, which must have been, indeed, well filled.

Several excellent photographs of him were taken, once while sitting on Mrs. Walker's hand, and another in a similar position in Miss Hattie Merrill's hand. Many happy hours were passed in his company, and we hope to renew his acquaintance next summer. Of one fact we feel assured—that he had a sufficient quantity of food stored away to support a good-sized family during the winter.

LILLIAN G. BULLOCK, M. D.

Manchester, N. H., Jan 20, 1902.

These, with a soothed or elevated heart,
May we behold ; their knowledge register ;
Observe their ways ; and, free from envy, find
Comp'acence there :—but wherefore this to you ?
I guess that, welcome to your lonely hearth,
The redbreast, ruffled up by winter's cold
Into a 'feathery bunch,' feeds at your hand :
A box, perchance, is from your casement hung
For the small wren to build in.

—*The Excursion.*

The Brook Shoal.

BY DOROTHY MAY.

A little brook murmured lazily through the woods where the yellow and white violets bloomed in the early spring sunshine, and later the ghost flowers gleamed through the ferns, and the heavenly song of the veery floated down from the heart of the tall hemlocks. Coming out into the sunshine, its way lay down a rocky steep, where it plunged and boiled and swirled in miniature cataracts and rapids, until, reaching the lower levels, it ran, deep and foam-flecked, by the garden, and then spread itself over a large shoal.

In the house beyond the garden lived a child who had no other playmates than the brook and the wild life in and about it. She danced up and down the banks to the wild music of the stream. She laughed and sang with the brave chickadees and the bluejays in winter, and in summer joyed in all the tuneful things that haunted its shores. But most she loved the shoal, for there, curled up and hidden in the tall grass, she could watch for hours the ever-changing life.

Here came the eave swallows by dozens for mud to build their adobe houses under the eaves of the neighbor's old barn across the road, and she need only turn her head to see the little masons working up in Swallow Row. And when the cozy homes were finished, and these birds of the sky, in whom the maternal instinct had conquered all else, folded their long wings to sit patient day after day, what chatter floated down! How a choice bit of gossip, started by Mrs. S. of No. 1, twittered down the Row! How they wondered that any bird could live without society! Now, there were their cousins, the bank swallows, a great colo-

ny of whom lived just around the bend of the road—as Mrs. S. of No. 8 remarked to her neighbors—"They dig a hole in the bank three feet deep, with only their tiny beaks for tools, and there, in those dark, lonely dungeons, they sit to hatch their eggs. Only fancy! Such air and sun loving birds, too!" But both kinds came to the shoal for insects that are always more plentiful over water, and they darted and dipped in graceful curves, and the eave swallows caught the gleam of the sunlight on their iridescent feathers.

At the end of the shoal the brook plunged down among the rocks again and ran under the big bridge over the road. Under there, where it was always cool and mossy, a phœbe built her nest on a jutting rock. Phœbe, too, came hunting over the shoal. Day after day, a kingfisher perched on a dead limb, and watched for fish, ever and anon dashing down into the water with unerring aim and bringing one back to his perch to be dexterously slipped down through that enormous beak.

The water wagtails tetered solemnly up and down in the edge of the water, picking up insects, but they never even looked at the little sticks of rotten wood that lay strewn about. *They* could not be good to eat. Whereat the child laughed. She knew these same sticks could walk well enough when they thought no one was seeing. She had picked them up, though they sometimes clung close to the ground, and there was a soft white worm in the queer little house. She thought it like a fairy story then, and not much less strange when, many years after, she learned they were caddice-worms, and that later in their existence they dropped the heavy burden and flew about on gauzy brown wings.

And like another wondrous fairy story were the skaters, whose feet made just the tiniest dents in the surface of the

water over which they threw themselves with such long strides without sinking. And there were the funny whirligig beetles, who jerked up and down and sideways in the water, with no possible method in their madness.

Butterflies wavered uncertainly about, as if drunken with the nectar of flowers, or like boats with too large a spread of sail for their ballast; then settled slowly down to eating mud. What *is* the affinity between this emblem of immortality and mud?

Dragon-flies flashed through the air like living jewels, compelling the child's admiration; though, having been told the wicked slander, that they were the Devil's darning-needles, and would sew up her mouth if she told lies, and fibbing being her besetting sin, she involuntarily covered her mouth with both hands.

Here, too, were frogs—all sizes of frogs—from the tiny tadpole that she watched through the strange change from tadpoles to legs, to great green bullfrogs, one of whom always sat on a flat stone at the edge of the shoal, with toes turned in and eyes closed to a narrow crack, and a sanctimonious expression, as if saying his prayers, until some luckless insect alighted near, when, presto! his eyes and mouth were open, his toes wide apart, and the unsuspecting insect was in that capacious stomach that came clear up to his lips while one was winking. When the child heard the story of Jonah, she wondered if he kicked up such a rumpus inside the whale as the bugs did inside the frog—before they were digested.

The muskrats swam down sometimes from the deep, dark water, but when they saw the child, they were back again like a thought. They were too daring once, though, and that was the beginning of their extermination. It happened in this wise: An old hen hatched out a brood of very surprising chickens. Such wide noses, short legs, and web feet were never seen in her family before, but she

was let free to take her children about, while the other mothers of her acquaintance had to stay in a barrel with slats across the end. How proudly she led them forth, and when they caught the sound of running water, and ran pell-mell for it, she followed with what haste she might; but imagine her horror when she saw them actually going in to that deadly water! In vain she screamed and raved; the ducklings contentedly floated and bobbed about, unheeding her cries. Suddenly the muskrat saw, and he swam stealthily out from his hiding-place under the bank, grabbed a little webbed foot, pulled it down under the water, and that duckling went to make a muskrat's dinner. The child ran crying to the house and told the tragedy, and the men took down their guns and set their traps, and the doom of muskrats was sealed.

The water was usually clear enough in the shoal to see all the fish. "Nothin' but shiners; no account except for bait." So the hired man said; but they were pretty, like silver, where they caught the light, with one dark stripe on the side, and the shoal was their nursery. They grew to think the child harmless, and spread themselves out in the sun fearlessly—always in perfect ranks, like soldiers, never half an inch variance, about fifty or sixty of the babies half an inch long, of those a year old and one inch long only twenty or so, and those still larger and older were usually too few to be in ranks. The child sagely concluded they were "winter killed." She thinks now they were killed in winter—as well as in summer—but not by the cold. When quiet, the procession always swung with the stream—never across it. There was just a faint, sinuous movement, to keep themselves from being carried by the almost imperceptible current. Why has so little been said of the perfection of grace in every motion of a fish?

One early spring the child was given a brood of newly

hatched chickens, to be called her own if she would feed and care for them. She trudged joyfully about with her pan of meal dough, and would have killed them with kindness, if allowed. But one sad September day they were gone—her chickens that she loved. The brave young roosters, whose spurs and voices were just growing, were sold to make chicken-pie, and the demure and lady-like pullets had gone to swell the harem of some lordly old rooster. And to crown her sorrow, the hired man had laughed at her! So, with her heart quite broken, she had gone to the shoal for comfort. Her tears had brought the unusual favor of a doughnut between meals, and it came to her suddenly to try feeding the fishes, who never had any food that she could see, and who never could be sold away from her.

So she began very slowly and gently, as one must who hopes to tame wild things. At first they flashed away into the deep water, fearing even the little friend they knew so well might mean mischief when she took to tossing things at them. But after a time the boldest ventured carefully out, caught a morsel and dashed away to eat it. It was very good, and he was soon back and others with him. With a large part of animal creation the way to the heart lies through the stomach—certainly with fish. Doughnut proved to be their favorite diet, and after some days they would follow her, swimming close to the shore, as she marched proudly up one side of the shoal and down the other, and at sound of her coming step they "broke ranks" and crowded eagerly up to be fed. They even learned in time to eat from her hand as she held it under water. But nothing would induce them to eat with strangers who came from curiosity, looking on. They could only be seen peeping cautiously out from under the banks of the deep water. The spectators must themselves hide, as did a nature-loving lawyer from the near city, who, curling up his

long limbs behind the friendly shelter of some alders, watched their pretty performances with delight.

This may sound like a "fish" story, as indeed it is, but, unlike most fish stories, it all really, truly happened.

Organotopic Plants. V.

BY FREDERICK W. BATCHELDER.

The plants of the genus Drosera, popularly named sundew, were described in the last article. These plants not only catch insects and other small animals for food but they actually digest the substance of them, after the manner of animals. Our other insectivorous (better called carnivorous) plants do not possess the power of digestion and therefore have to avail themselves of indirect methods in obtaining nitrogenous material from their prey. These methods will be described in connection with the two local genera which remain to be considered.

Like the other carnivorous plants the bladderworts (Utricularia) are unfamiliar objects from the fact that their habitat is usually difficult of access. About a dozen species are given in the manuals for New England. As yet only three species have been positively identified in the vicinity of Manchester. These are Utricularia cornuta, resupinata and vulgaris. The first and last are rather common; the second is rare and local. I have found them all in a single station here. U. cornuta grows on the borders of boggy ponds or mud holes, rooting in the mud. It has a scape five to ten inches in height, bearing several bright yellow flowers which are shaped somewhat like those of the snap-dragon. The flowers of vulgaris are also yellow, but the plant is strictly aquatic, with floating, finely dissected leaves. The plants of resupinata are small, from

two to five inches in height, and very slender. The flowers are purple, small, solitary and set transversely on the summit of the scape; whence the specific name, resupinata.

I have found this beautiful little plant only once, in a very dry season. It was then abundant and I collected a good supply of specimens. These were destroyed, with the rest of the herbarium of the Institute, in the recent fire. It will be a rare piece of good fortune if the conditions shall favor a similar collection during the coming summer.

But how can these pretty, innocent looking things be classed with the carnivorous plants? Perhaps the terrestrial species may give no sign of a predatory habit; but if one of the aquatic species is closely examined it will be noticed that numerous little, translucent, bladder-like sacs averaging one-tenth of an inch in diameter, are borne at various points on the finely divided leaves. The question at once arises, what are these bladders for? It was at first supposed that their office was solely to float the leaves. But it was soon found that leaves which had no bladders attached to them floated just as well by means of the air which fills the intercellular spaces. Further investigation showed that the bladders themselves contained the remains of small animals, and careful observation soon proved that these remains did not come there by accident, for living animals were seen to enter. Now, if they were free to enter, were they not also free to depart? So a watch was kept, and it was found that although the poor creatures could get in they could not get out! So, next, the entrance to the bladder was examined, and there was discovered the neatest little trap-door imaginable. It opened most beautifully inward and closed most maliciously outward, as if, in a swing door between dining room and kitchen, the door should swing freely at a push from the kitchen side, but lap over the jamb on the dining room side, so that it would have to be pulled open from that side.

All these things indicated that there might be some design, so far as design may be attributed to plants, in these several arrangements. The movements of entrapped animals were watched, and it was found that they died soon after entering the bladder, apparently asphyxiated from the lack of oxygen in the enclosed water. One observer records that a small crustacean on entering, would at once manifest alarm by drawing in its feet and antennæ and closing its shell, probably feeling that he had got into unhealthy quarters. In fact, one animal after another gets in and stays; stays because he has to; and so the animal accumulation increases and may in the end nearly or quite fill the bladder. As many as a dozen small crustaceans have been found in a single bladder. There are also sometimes found small worms, insects and larvæ.

The plant having thus secured its prey, what disposal does it make of it? It cannot expel it, and it cannot digest it. Examination of the inner surface of the bladder shows that it is covered with four-pointed processes, or hairs, of a kind which possess in a high degree the power of absorption. These hairs, then, correspond with the digesting apparatus of Drosera, and enable the plant to assimilate the products of the decay of animal substance which goes on within the bladder. So the bladderworts get their supply of nitrogenous material at second hand, something as a patient, temporarily deprived of his digestive apparatus, might be kept a-going by baths in lobster bisque!

The terrestrial species sometimes have a few bladders on the rootlets, or on creeping and rooting shoots; otherwise they appear to be rather saprophytic than insectivorous.

The pitcher plants (Sarracenia) are more familiar objects than either the sundews or the bladderworts, being of good size and growing in almost any moist bog or swamp.

Everyone knows that the hollow, trumpet-shaped leaves are receptacles for water. Linnæus suggested that they might be reservoirs of water for the use of the birds. Very curiously, another botanist, Catesby, thought they might be refuges of insects from their pursuers! Alas! the insect that takes refuge in or on a pitcher plant is pretty sure to meet an untimely end. As Josh Billings says about the man who has begun to travel the downward road, he finds everything greased for the occasion! In the first place, a honey-baited pathway leads up from the ground, and the insect finds himself soon on that gaily painted lid, the under or inner surface of which is coated with nectar. He revels here in sweets till suddenly, as he approaches the inner edge, his feet slip on a glassy surface. In vain he tries to climb back; not only is the surface slippery but there are also downwardly directed points, and he must perforce travel down, down into the pool within the hollow leaf, where he is eventually drowned. The plant secretes a large quantity of some fluid which appears to accelerate the decomposition of the animal contents of the reservoir, and the supply of nitrogenous material thus obtained doubtless benefits it and gives it an additional advantage in the struggle for existence.

The story of the organotopic or dependent flowering plants cannot yet be told as it will be told when more extensive observations have been made with regard to plants in which the effects of the abnormal relations are less evident. We simply know at present that these plants may be conveniently divided into five well marked groups: Epiphytes, which simply locate themselves upon other plants; Parasites, which are not only located upon but also draw nourishment from their hosts; Saprophytes, which subsist upon vegetable or occasionally animal matter in a state of decay; Symbiots, which form partnerships with other plants, both partners benefiting from the alliance;

and Insectivorous (Carnivorous) Plants, which in various ways add animal food to their diet.

The next and final article in this series will treat of a specially interesting and also rare partial symbiot.

Tripoli Powder in Newbury.

BY WILLIAM H. HUSE.

In the picturesque town of Newbury just over a hill from Lake Sunapee, lies a little sheet of water, snuggling cosily among the hills. For years it has borne the name of Chalk Pond. It is comparatively shallow, holds a few fish, and contains a small, rocky island on which boys like to camp in summer and play Robinson Crusoe.

The peculiar name is given because of a deposit that covers the bottom, which, upon drying, is of almost chalky whiteness. A visit to the pond last summer and an examination of the deposit with a compound microscope showed that the "chalk" is diatomaceous earth. It is not of very recent deposit, as the shells are nearly all broken. Thus comminuted by nature, it is of exceeding fineness and is already in good condition for a polishing powder. If of sufficient depth the deposit might have some commercial value.

"The Boy of Winander."

Six pieces of statuary in the Congressional Library represent as many boys, the subjects having been taken from poetical descriptions. One of these stands in the attitude of listening, and the "gentle shock of mild surprise," that "carried far into his heart the voice of mountain torrents," mutely informs the reader of Wordsworth that here is the "Boy of Winander," the boy that, "ere he was full twelve years old, was taken from his mates and died," but who, in his short life, drank deep of Nature's spirit, and was known so well by the cliffs and islands that he loved.

Many an over-grown boy whose hair was changing, and many a proudly reserved woman who was still at heart a girl, has been moved to greater patience and gentleness with the little ones by the poet's picture of this Boy, who at evening stood "beneath the trees or by the glimmering lake" and "blew mimic hootings to the silent owls."

There was a Boy; ye knew him well, ye cliffs
And islands of Winander!—Many a time
At evening, when the earliest stars began
To move along the edges of the hills,
Rising or setting, would he stand alone
Beneath the trees or by the glimmering lake,
And there, with fingers interwoven, both hands
Pressed closely palm to palm, and to his mouth
Uplifted, he, as through an instrument,
Blew mimic hootings to the silent owls,
That they might answer him; and they would shout
Across the watery vale, and shout again,
Responsive to his call, with quivering peals,
And long halloos and screams, and echoes loud,
Redoubled and redoubled, concourse wild
Of jocund din; and, when a lengthened pause
Of silence came and baffled his best skill,
Then sometimes, in that silence while he hung
Listening, a gentle shock of mild surprise
Has carried far into his heart the voice
Of mountain torrents; or the visible scene
Would enter unawares into his mind,
With all its solemn imagery, its rocks,
Its woods, and that uncertain heaven, received
Into the bosom of the steady lake.

The Institute's Loss.

On the night of January 14, 1902, the large block in which the Manchester Institute of Arts and Sciences had been located since its organization was destroyed by fire. The Institute's loss was total, the six-story building itself being utterly consumed. Fortunately there was no loss of life; for although there had been a largely attended meeting of the Section in Ornithology that evening, its members had dispersed shortly before the alarm was given.

The Section of Fine Arts owned several paintings of considerable merit, numerous groups of statuary, many rare and costly curios, casts for the drawing classes, and a complete wood-carving outfit, consisting of tables, tools, designs and all the usual appliances. The loss by the Ornithological Section was also very heavy in birds, nests and eggs. The Botanical Section mourns the loss of a beautiful herbarium, containing a nearly complete representation of the local flora, while the Sections in Mineralogy, Zoology and Entomology lost good working collections in their respective lines. The loss of the collection of insects is particularly regrettable, as it contained the types upon which the published lists of dragon-flies in the vicinity of Manchester were based. The Institute's general museum was peculiarly rich in objects of historic interest and in material illustrating the home and field life of the earlier inhabitants, including the aborigines themselves, much of which material can never be replaced. The loss of its library was also a heavy blow to the Institute. It was especially rich in works upon art, some of them very expensive, and a considerable number of the scientific books are out of print and exceedingly rare. The reading room was well supplied with current scientific

literature, all of which, of course, was lost, NATURE STUDY finding itself without a single exchange on the morning after the fire.

Disastrous as the fire had proved to be, the regular work of the Institute was scarcely interrupted. A new location was promptly secured, fitted up, a lecture in the course on literature was given before a large audience on Saturday evening, the Entomological Section continued its regular work on Monday evening, and the other Sections followed in the order of the calendar arranged at the beginning of the year.

The Institute has an active membership of more than 400 representative citizens, is strong financially, and will go on eagerly and systematically with its pleasant task of building up an instructive museum, restocking its library, and prosecuting its researches in its chosen fields.

The Institute's Herbarium.

The herbarium of the Institute, totally destroyed in the recent fire, consisted largely of the collections made by Mr. F. W. Batchelder during the last twelve years. There had also been important contributions by Mrs. Maria L. Clough, of this city, Mrs. Maria L. Owen of Springfield, Mass., and others. Though this collection was not yet large, reckoning by the number of sheets, nor fully representative of the local flora, it contained many specimens of special interest as being rare or unexpected. There was a good representation of ferns and orchids and especially of the grasses. It may be difficult to replace some of these from the local stations. It is hoped that all persons interested in the local flora will make the effort to collect during the coming seasons, so that an herbarium worthy of so rich a region may, in the course of time, be formed.

Our Exchange Table.

The growing demand on the part of school boards that nature study should be taught in the public schools, regardless of the qualifications of the teacher, has led inevitably to some surprising results. An incident related in the current number of the *Library Journal* illustrates the possible effects of a combination of nature study and pedagogics. A young girl came into a public library and asked for a book about worms, because she had to teach the subject next morning. It was duly handed her. "I don't want these," she said, "I want the worms that turn into butterflies." Then she added quite solemnly, "I don't know anything about the subject, but I know the proper method of teaching it. *That* is the important thing."

In the January number of the *Journal of the New York Botanical Garden* Dr. Britton writes: "The thoughtless and indiscriminate picking of flowers and breaking of twigs or branches from wild plants is an offence perpetrated by many persons who ought to know better. Every effort to educate people to realize that plants which are thus picked or broken cannot be enjoyed by others who follow them is a distinct aid in diminishing selfishness and in developing the more healthy taste to preserve natural objects rather than to deface or destroy them. In the vicinity of many of our cities and towns, wild flowers, once common, have become rare by such vandalism, so that the healthful pleasure and interest of woodland walks have become much less enjoyable."

The *Ohio Naturalist* for January gives account of the new sunflower which has been described and named by Dr. Britton as Helianthus Kellermani—Kellerman's sunflower. A few years ago roots of the native species of Helianthus were brought from the vicinity of Columbus

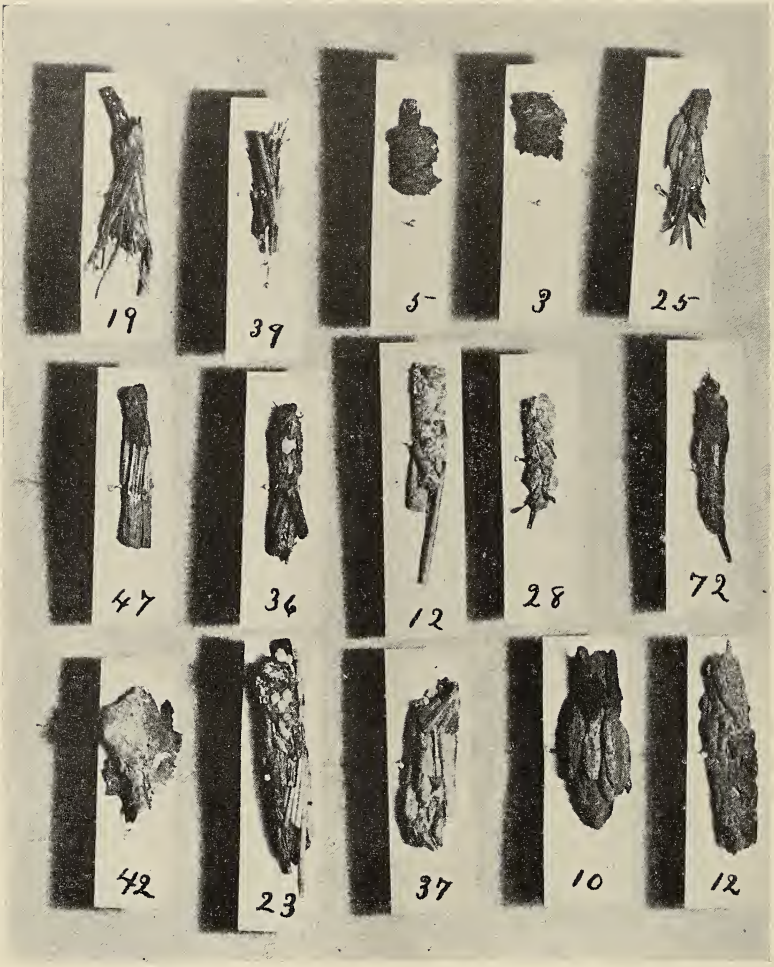
and planted on the college campus south of the Botanical building, Ohio State University. In 1897 a form was noticed that differed materially from the enumerated species of the state. Later it was observed more carefully, and finally specimens were submitted to Britton of the New York Botanical Garden. The *Naturalist* prints an excellent plate, and says: "The accompanying plate will give some idea of this elegant sunflower. It is not coarse and weedy in habit as so many of the other species, though rather tall. It is a good bloomer and would doubtless be desirable for ornamental planting. Roots will be furnished gratis to botanic gardens and to all who may wish to grow this form for observation or for ornamental purposes. Herbarium specimens are likewise on hand for those wishing the same."

The Misses Olivia and Caroline Phelps Stokes have presented to the New York Botanical Garden the sum of $3000, on condition that the interest of the fund shall always be used for the investigation and preservation of native plants, or for bringing the need of such preservation before the public. The Board of Managers decided, in accepting the gift, to offer prizes of $50, $30 and $20 for essays upon the preservation of wild plants, including shrubs, herbs and trees. The essays for 1902 were to be submitted before February 1, and those awarded prizes will be published by the *Journal of the New York Botanical Garden* in its issues for March, April and May.

The January number of the *Journal of the Maine Ornithological Society* contains the following bird note, which is of general interest by reason of the localities and dates: "We have seen several flocks of goldfinches in Knox, Lincoln and Kennebec counties. Large flocks of snowflakes are also common. A robin was feeding beside the shore of the lake at Liberty on Thanksgiving morning. The night previous was very cold and windy, yet he seemed as bright and cheery as though he had just returned in spring. An American creeper was seen creeping on the trunk of a large elm, in Waterville on December 30th. I also saw a small flock of red

crossbills in Knox County late in November. Mr. Briggs reports the pine grosbeak quite common in Livermore, in Franklin County, late in November. I saw several flocks of them while in Farmington on December 28th-30th. Also a small flock in Waldo County on January 2d."

A dispatch from Reading, Penn., to the New York *Tribune* states that it is possible that the great collection of butterflies made by the late Dr. Herman Strecker may go to the American Museum of Natural History, in New York City, for, although Dr. Strecker refused many offers of thousands of dollars for his collection, it is understood that it will now be offered for sale. Dr. Strecker was perhaps the greatest collector of lepidoptera in the world. His collection contains 250,000 specimens, and is said to be the finest in existence. There are only three others which compare with it—the collections of the Grand Duke Nicholas of Russia, a private museum of Berlin, and the collection of the Rothschilds in England. Dr. Strecker corresponded and exchanged specimens with all these. The other great collections are of butterflies only, and do not include moths. The Strecker collection includes butterflies and moths whose haunts in life are in every portion of the discovered globe, not excepting the regions close to the poles, the wildest forests of Africa, India, Australia and South America, and the smaller islands of the Indian and Pacific Oceans.



SOME QUEER STICKS.

Photographed for Nature Study by E. H. Fogg.

NATURE STUDY.

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Some Queer Sticks. I.

BY EDWARD J. BURNHAM.

There is always a fascination about a brook or pool. The artist-author, Du Maurier, understood this, and no doubt was influenced by both the instinct of art and a genuine love of nature when, in his "Peter Ibbetson," he had the two children, on their holiday afternoons, make eager pilgrimages to the dark pool in the wood to watch for the Dytiscus, the big water beetle, that often came boldly swimming out in sight of them, when they had waited patiently.

There is so much life in a brook; and a great part of it is so novel as to be almost uncanny. There are queer, squirming things that roll about, without legs, and looking like plump meal-bags, tied at one end. They will be real flies some day, with two gauzy wings, and will sport in the sunshine, with nothing about them to suggest that once they were such unseemly, footless grubs. There are the stone-fly nymphs, or young, sprawling on the under side of stones where the water flows rapidly; and in the pool below the rapids are the may-fly nymphs, with their graceful, undulating way of getting about, and with their

breathing apparatus on the outside of their bodies. And often one will find a six-legged creature that is more grotesque than graceful, squatting on the mud of the bottom, or buried in it, or clinging to some reed or water-bush. It will be a beautiful dragon-fly some day, if it escapes its many enemies; but the only promise it now gives of so great a change in its appearance and habits is in the little wing-pads on its back. Sometimes, particularly in spring and early summer, we may see these beginnings of wings on the stone-fly and may-fly nymphs as well, when we have learned to look for them. Besides these, there are active, wriggling creatures, with stout jaws, and with three pairs of true legs on the three segments of the body nearest the head, and with never more than five pairs of short, unjointed "pro-legs" on the under side of the abdomen. These are the larvæ or young of water beetles—of the whirligigs, and the water scavenger beetles, and of the big and little members of the Dytiscus family; and with them are many other queer, squirming things—each of them the young of some insect or other creature, and of so many kinds that years of patient study will scarcely suffice for us to learn about them all, or even to call them by their names.

But the queerest and most uncanny of all the queer and uncanny multitude are the sticks, and little cob-houses, and tiny stone-cases that seem to be alive, and which do move about, with funny jerks, in an uncertain sort of way, at the bottom of the brook or pond. In each of these queer houses is the young of a caddis-fly. Sometime, if it can avoid being eaten up, it will be a graceful insect, with a slender body, long legs and antennæ, or "feelers," and four brown wings. But they were hatched from eggs that their mothers placed in the water, and they must stay there, until they grow up, right among the fishes and the many other creatures that would be glad to eat them. So

they must build houses to hide in, and they begin building almost as soon as they are hatched from the egg.

There are many kinds of caddis-flies, and each kind builds a particular style of house. Some, in swift, clear water, build of grains of sand, and often their houses are very beautiful. Some build of pieces of rotten wood, as shown by Nos. 10, 12 and 37 in the illustration. Some build of pieces of flat grass, or the thin outer covering of water plants, making round, slender cases, with joints, quite like bamboo fishing-rods in miniature, as No. 47. Some build in a rude way, of grass and weeds, as in No. 19, and some of pine or hemlock needles, like No. 25. Many build of sticks; and some of these lay the sticks straight along their bodies, and some lay the sticks diagonally, as in No 23. Some begin with sticks and finish with stones, as in the No. 12 in the middle of the photograph, and in No. 28 beside it. Some—and these are the most abundant of all in the brooks and ponds near Manchester—build "cob-houses" of bits of twigs and stems of plants, laid crosswise, as shown by Nos. 3 and 5; and a few, the queerest and rarest of all, try to fool the fishes by fastening together entire leaves that have been blown into the water, as in No. 42. It is a rude and crude sort of shelter, and may not afford much protection, which perhaps explains why the leaf-builders are comparatively rare.

Whatever the material of which the house is built, or the outside form may be, the interior is always a hollow cylinder, which the industrious little artisan has lined with silk, for the caddis-flies are upholsterers as well as carpenters and masons. In another paper we will try to learn something of their ways of life, and perhaps, too, something of their structure and relation to other insects.

Some Rare Visitors.

BY STELLA MAY.

One day in late autumn, as my brother was returning at dusk from a long tramp after witch-hazel blossoms, his attention was attracted by an unfamiliar bird, circling round over a tall, dead stump at the edge of the woods. It uttered a peculiar, tree-toad-like call repeatedly, as though waiting impatiently for him to go away before settling down for the night into one of the holes with which the upper part of the stump was riddled. The bird was evidently a woodpecker, though its call was entirely new to him, and it had grown too dark to distinguish its coloring. His curiosity was greatly aroused, but at other visits to the place, during the daytime, he saw nothing of the strange bird.

Later in the season I learned that a friend had seen a red-headed woodpecker within a mile of our Newton home. The news seemed almost incredible, on account of the extreme rarity of the species in this section of the country, but when, soon after, one was seen in Brookline, and later in my own town again, I realized that the unexpected visitor was surely here, and began to keep a sharp lookout for him on my walks, but without result.

Finally, one hot July day, the *Evening Transcript* came with Bradford Torrey's weekly bird article. Then I learned that not *one* bird, only, was here, but a *pair*, and that they were actually nesting and rearing a brood of young birds in the immediate vicinity!

This was exciting news indeed, for while the birds themselves are rare here, their nests are rarer still, this one being the very first that has ever been recorded from the eastern half of Massachusetts. Mr. Torrey had taken the

wise precaution not to tell definitely where the nest was located, but his description of the tall, dead stump, standing like a lamp-post at the edge of the sidewalk, in an exposed position, recalled to my brother immediately his unexplained experience of the previous autumn, and he felt certain that his unknown woodpecker was a red head.

Early the next day, in great excitement, we made our way to the spot, and there, sure enough, on a dead tree near the stump, preening his feathers in the sunshine, sat a magnificent black and white woodpecker, with rich, velvety crimson on head, neck and throat!

Our first thought, after admiring the bird for a minute, was to locate the nest and see for ourselves the little gray heads of the young birds peering out of the opening. But although there were plenty of holes, and one showed signs of more recent use than the others, we got no sight or sound of life within, and were reluctantly forced to believe that the young birds had left the nest. We soon found that they had not ventured far, however.

Near the nesting-place, overlooking it easily, were houses and intersecting streets, while behind it rose a wooded knoll, and beyond that stretched woods for a mile or more. Our attention was soon called to the large trees, oaks and chestnuts, on the knoll beyond us, for a second bird had appeared and was greeted there by a chorus of impatient young voices. We quickly located three young birds, two in one tree, the third in another, and suspected the presence of a fourth bird, but were not quite sure of it.

The heads of the young birds were gray, without a suggestion of crimson, and the bodies were more or less mottled and streaked; but the white marking of the back and wings was so like the old birds that they were very easily recognized. These white spots on the rump and wings form the distinguishing mark of both adult and immature birds when in flight, forming a great patch or band of

black-bordered white across the body and spread wings, almost from tip to tip. The wings naturally seem long, compared with the short woodpecker tail, and this striking white patch greatly heightens the effect, making the bird seem much larger than he really is.

The young birds did not move about much, and for a long time we watched them as the old ones came and went, with food or in quest of it; the young waiting quietly while their parents were out of sight and calling clamorously the moment they reappeared.

It was very funny to see an old bird light near one of the young ones with a dainty tid-bit in its bill, and hold it there provokingly while the baby teased and cried for it. Several times I saw one of the babies try to snatch something greedily, only to have its parent hop quickly backward or onto another limb, evidently admonishing its offspring to be more polite and patient. At last it would give up the morsel and fly away in search of another. Generally I could not tell what kind of food was brought, but one time I saw distinctly, with my opera glass, a ripe, red raspberry, like a red knob at the end of the strong, dark bill.

When, a few days later, I revisited the spot, two of the young birds were still there. They were quite as willing as ever to be waited upon by their parents, but the old birds were beginning to leave them more or less to their own resources, and did not come to them nearly so often as before, frequently returning without lood, even then. One of the young birds seemed much less lively and capable than the other, and I thought he might be really feeble, until he suddenly spread his wings and flew quite a long distance. Then I decided that he had been "playing possum," or was merely *full* and sleepy. One of the young birds spent considerable time on a telegraph pole near by, tapping it in true woodpecker fashion. That

was the most "grown-up" thing that I saw any of the young birds do.

I am looking forward expectantly to the coming summer, hoping that the birds will nest here again. But the great, dead tree with the white, spreading branches, that stood near the stump, where I caught my first glimpse of the red heads, has since fallen, and I fear that the place will not seem so attractive to them now that their dressing-room, and resting-place, is gone.

Newton, Mass., February 22.

Organotopic Plants. VI.

BY FREDERICK W. BATCHELDER.

A wood on the shores of Lake Winnipesaukee is the hiding-place of the rare and beautiful plant which is the subject of this article. The plant is one of the treasures of the leaf-mold, a "humus plant." In anticipation I have already alluded to it as a hemi-saprophyte, and also as a partial symbiot. It may be either—very likely it is both. The forest here has long been undisturbed by the woodman's axe, and a layer of organic matter in a state of decay covers the ground, so that the conditions are favorable to the development of the organotopic or dependent plants. Moisture and darkness combine to give them a suitable habitat. Under the beeches grow the beech-drops (Epiphegus,) under the oaks the squaw-root (Conopholis,) and scattered about are the cancer-root (Aphyllon,) the coral-root (Corallorhiza,) the Indian pipe (Monotropa,) and the false beech-drops (Hypopitys.) As a rule, where any rare plants are found, one should look for other rarities; so in this spot there is an incitement to careful search. Here is a rugged slope extending from near the lake shore upward towards the high hill beyond. Hemlocks, birches, maples

and beeches are the prevailing trees. The undershrubs are small and scanty, for the ground is strewn with rocks, mostly jagged and angular, as if split off by frost, ages ago from the ledges farther up. In the little depressions between the rocks there are accumulations of leaf-mold. Here is the place and now is the time to begin the search. No highland huntsman ever stalked the deer with greater ardor than that which seizes the true lover of wild plants when he is on such a trail as this! Look where the furrows still remain in which the melting snows ran off last spring—look all around the bases of the tree trunks—look in the little leaf-strewn hollows between the rocks—look where a musical gurgling betrays the underground rill! Ah! do you see this little thing? What a dainty bit it is among its plainer companions! The plant is just about five inches high, with a purplish stem which bears a few very small clasping leaves. Near the summit there is a flower of exquisite shape, color and odor. That it is an orchid is at once evident, for the three sepals and the two unchanged petals are there, all of the purest white, tinged with pink-purple, and the lip is there, similarly tinted, but with the addition of a delicate greenish crest along the middle. It is truly a fairy flower. For a wonder, it has an appropriate common name, "three-birds," the best developed plants having usually about three blossoms pendent from the axils of the little leaves. The botanical name is Pogonia pendula Lindl, or P. trianthrophora (Sw.) B. S. P. This is the rarest of our three species of Pogonia, P. ophioglossoides being common and P. verticillata rather rare.

That was a red letter day when in mid August about ten years ago I lighted upon these rare orchids. I found them in two stations about half a mile apart. In the station where they were most abundant they grew in patches or colonies. In one patch about fourteen by eight inches

in extent I counted one hundred and twenty plants in flower. I could have run my hand under the light leaf-mold and lifted the whole mass together, so slight was the connection between the plants and the ground beneath the layer of humus. Though I have visited this station several times since, I have not found there a single plant. In the other station the plants have been very scarce until last season, when they were again abundant, though not as well developed as they were on my first visit.

Both the habitat, or dwelling place, and the habit, or "look," of these plants suggested the thought that they might be dependent on abnormal methods of obtaining subsistence, *i. e.*,that they might belong to one or more of the groups of organotopic plants. It so happened that I received last season from botanical friends in Massachusetts —(to be sure, we had never met.—but then, all botanists are friends,)—a request to furnish fresh plants of this orchid in flower for purposes of artistic illustration. In corresponding about the matter I communicated my suspicions concerning the character of the plant and received from one of the friends, an expert botanist, a request for plants also for purposes of critical examination. On the eighteenth of August the station was visited and a sufficient number of plants collected and sent for both purposes. The examination of the plants, and especially of the roots, revealed most interesting points with reference to the mode of life of the species. These points are substantially as follows.

The plant appears to be a saprophyte, or rather, hemisaprophyte. The most evident indication of this is the paleness of the parts which are above ground. Chlorophyll appears to be but feebly developed. This fact alone indicates that the plants are more or less dependent on prepared food from some outside source. As there are no signs of the attachment of the roots to those of any other plant, it cannot be a parasite, and the assumption is that

the organic food needed is taken from the decayed vegetable matter in the humus. Therefore the plant appears to be properly classed with the hemisaprophytes so far as the material of its subsistence is concerned. But this is not the whole story. The microscope shows that the cells of the root are penetrated by root-inhabiting fungi, the hyphæ of which connect curious knotted growths in the different cells. So the plant has also to some extent the character of a symbiot. Whether the fungus is more than a parasite is not yet known with certainty; but when a plant which is evidently deficient in chlorophyll, is known to be infested with fungi, and to thrive well nevertheless, it seems reasonable to suppose that the association, whatever it may have been originally, has come in the course of time to be beneficial to the phanerogam (flowering plant) as well as to the cryptogam (spore-bearing plant.)

Recent studies have shown that the apparent co-operation of higher and lower plants occurs to a greater or less extent in most if not all terrestrial orchids. In this particular case of Pogonia pendula the relation is unusually well evidenced. So, in defining the species in its relation to the five groups of organotopic plants it would seem proper to call it both a hemisaprophite and a partial symbiot.

Like many other plants of the class, this exquisite little plant behaves very badly in drying. Hence good herbarium specimens are almost out of the question. Fresh plants, if taken in their own leaf-mold before the flowers are fully expanded, will keep in good condition for several days.

This series of papers might have been appropriately called "Queer Things Plants Do." There is the parasite, which literally "saps the life" of another plant, or hugs it to death, or both. There is the hemiparasite, hypocritically pretending to get its food in a good honest way, but all

the while slyly sending out rootlets to steal from the neighbors. There is the saprophyte, too lazy to prepare its own food, and so compelled to eat what other plants have thrown away. There is the hemisaprophyte, sometimes, as in the present case, one of the most beautiful of flowering plants, for some strange reason also treading the downward road. There is the symbiot, forming partnerships with the lowest of the low, and turning pale with shame and degradation. The epiphyte, the only innocent one of the lot, cares only for a place to live, and neither gives nor takes. The carnivorous plant, the guiltiest of all, has trespassed upon the domain of the animal world, and preys upon it with relentless ferocity.

Very queer doings, these, and provocative of endless fancies! But we have yet a great deal to learn about the intimate relations of the plant world with the animal world, and our knowledge must come, not from speculation but from observation. At present we are prejudiced against plants which behave, as we say, abnormally, and we call them degraded. Sometime we may find whether we are right or wrong.

Do Female Birds Sing?

Editor of "Nature Study":

The statement was made in a recent publication that the singing among birds was done by the males. I have reason to doubt this, and would like to know if the readers of NATURE STUDY can throw any light on the subject.

For two years, we have had in our possession a female rose-throated grosbeak, which sings and sings. Her song is very sweet, though soft, but with as many variations as that of the male bird. A friend of mine has a pair of these birds and her female bird pours forth similar melody.

Last summer, while loitering in the woods, we heard the soft, liquid notes of a veery, and discovered the songster, on a low branch but a few yards away. The streakings upon the bird's breast were almost invisible, and though the song was of the usual quality, it was not as loud as usual. We listened for a long time, then passed on. About a quarter of a mile farther on, we came upon another veery, which made the woods ring with its loud, clear notes. We did not get quite as close to this bird, but could plainly see the heavy markings upon his breast. We concluded, at the time, that the first bird which we saw was a female bird from the faint markings, and the softness of the song. There was certainly a marked difference between the two thrushes.

Though "one swallow does not make a summer," if one female bird sings, why may not others?

MARY HAZEN ARNOLD.

Waterbury, Ct. February 17. 1902.

Gulls and Terns of New England. I.

BY W. R. VARICK, M. D.

It seems best to confine our discussion, in this paper, entirely to the gulls and terns, though they constitute but one family in the order Longipennes; for the other members of the order who visit our neighborhood are very few and extremely rare—jægers and skuas are birds of the deep ocean, and the black skimmers have long since deserted our shores for the South.

Among the gross anatomical features of the family is the strong, horny bill, long, slender and straight in the terns; stout and curved, or almost hooked, in the gulls. The wing primaries are eleven in number, and very long, especially in terns, giving great power and endurance in flight.

The tail has twelve feathers. It is nearly square in gulls, but in terns it is forked, sometimes very deeply. The legs are strong, and the anterior toes fully webbed. The whole structure is admirably adapted to make the bird equally at home on the surface of the water or in the air above it. The species differ considerably as to size, but are quite similar in plumage—white, gray, slate and black predominating, several species adding a rosy hue to their white breasts in the breeding season. The two sexes are always alike in appearance. As a rule, though there are several exceptions, the gulls of North America prefer a more northern latitude than the terns, one family taking possession where the other leaves off. The Laughing Gull is the only one that breeds chiefly south of our New England coast, and the Arctic the only tern that prefers the cold northern climate.

I shall first describe the species that one might see on our coasts, and afterwards go on to the general characteristics of the family.

The gulls of eastern North America may be roughly separated into three groups, as regards breeding plumage. One type white and pearl gray, with no dark markings; another showing dark markings on the wings, but not on the head; the third, birds having dark-colored heads.

It will be best to begin with old friends, and first speak of the class of gulls with more or less black markings on their wings. The Herring Gull is the member of the family that inland dwellers in New Hampshire are most likely to see. Although commonest near salt water, he by no means restricts himself to a sea life. Large lakes and rivers inland are good cruising grounds for him. He occasionally visits Lake Massabesic. A year ago last December I saw one flying over the ice in the river near Martin's Ferry, and in January several remained, for a time, below Goffs Falls where the swift current kept the ice from form-

ing, having for company a flock of American mergansers.

Our Herring Gull has for many years survived with a specific name of its own, Larus argentatus smithsonianus, but it has been shorn from him and now there is nothing to distinguish him from his European relatives, except his good taste in locating his winter residence.

In adult plumage the first six primaries are tipped with white, and then show black bands diminishing in size from the first to the sixth. The first and second have also an extra white patch near the tip. The rest of the wings and the back are deep pearl gray; the under parts pure white. The claim of our gull to his extra name was in the fact that the two white marks on the first primary, were never united as in the European bird. But it was found that gulls, too, grow whiter with advancing years, and that birds that were discreet enough to grow old, could not be told from the European type, so the name of Smith had to be dropped. It takes a quick eye, with a good glass and a near bird, to see the spots at all. They breed over the whole northern part of North America, from Maine and the Great Lakes, northward; and in winter are found along the entire coast of the United States and on open water inland.

Harbors near cities are especially attractive to them, on account of the large amount of refuse that is thrown into the water, affording them a life of luxury, combined with the least amount of work.

In Boston they hover over the Charles River, entirely disregarding the clouds of smoke and steam that often envelope them from hundreds of locomotives. Last Christmas day over a thousand were counted resting on the waters of Fresh Pond, in Cambridge.

Even in summer an occasional bird may be seen, a jilted lover no doubt, who has no home or family, for they no longer breed south of Maine. The immature herring gulls are of a dull fuscous color all over, and when seen in a flock

the contrast is very great between their dusky garb, and the pure white of their elders. Youthful beauty does not count for much among gulls. They do not attain mature plumage until the third year.

The next gull, the Ring billed (Larus delawarensis), is more exclusively our own property, and is more common inland than on the coast. He is confined to North America, breeding from Minnesota and Newfoundland north. New Englanders only see him during immigration along the coast, in early spring and late fall. He winters from Long Island southward, but shows a preference for certain localalities, being rare in others.

He is five inches shorter than the herring gull, though almost an exact counterpart in plumage, the first primary lacking the terminal white spot. The detection of this requires a bird in the hand, but he has one characteristic mark, that gives him his name, the black ring around his big, yellow bill. The difference in size might be of use in identification if the two birds were seen together, as often happens, but the best point to me is an indefinable difference in actions. The first one I saw I suspected and watched till he showed me his diagnostic ring.

The last bird of this group is the great black backed gull (Larus marinus). To me he is the most majestic bird that ever deigns to visit us. His back and wings, except the tips of the primaries, are dark slate color, almost black, the rest of the plumage being pure white. He is from twenty eight to thirty inches long, almost as large as an eagle, and indeed, he looks it.

Commonly he is called the Saddle back or Coffin carrier, from the shape of the black mark on his back; but he bears his burden lightly, as he soars high in the air, watching with keen eye for some floating morsel of food, or a smaller bird whom he can rob of a hard earned meal. He reminds me of an unscrupulous game warden, who watches from

afar till some small poacher has caught a good fish dinner, then rushes up with great bluster and display of force, and appropriates to himself the poor little bird's prizes. Fierce and powerful, he is still a great coward, the shyest of the gulls when man appears. One often sees them resting on the sand beach, a quarter of a mile away, looking like big black and white geese, but as soon as a human head appears over the dunes, away go the gulls for parts remote. It is said that they even desert their eggs and young when man approaches, and show very little anxiety as to their fate. They are a more northern species than the herring gull, breeding on both sides of the Atlantic, in America north of Nova Scotia. In winter he is common along our coasts, and goes as far south as Virginia. I have seen occasional birds in August and September.

Snyder.

BY A PINFEATHER ORNITHOLOGIST.

Any full-fledged ornithologist would tell you that you could not see birds satisfactorily from a carriage; that if you would make a long and varied list you must trudge on foot over the promising territory, and listen with intentness at every step; that if your vehicle be a sleigh and you expect to hear the guiding chirp of the winter call note with the jingle of the bells drowning all finer sounds, you will be doomed to disappointment; and that you would do better to stay at home and read NATURE STUDY, for so you would get more profit to your mind.

This is true of every other bird lover in the world save this one; for no one else has Snyder, and I have. Now Snyder is a horse of some ten summers and an enormous amount of bird (as well as horse) sense. So trained has

he become that, when the reins drop suddenly and he hears a decided low "whoa," he stops on the instant and does not move again until he is spoken to; does not even breathe hard enough to creak the harness or jingle the bells which encircle him. Neither does he mind it when the reins are flung over the dash-board, and we, the Pinfeather Ornithologist and the Other Bird Lover, jump out of the sleigh on either side and rush off, screwing our bird glasses as we go, to the spot ahead where the birds are flying, leaving the horse to take care of himself. Patient as Griselda, he will stand there and watch me, his queer-acting owner, put a curious black thing up to my face, and gaze and gaze, talking the while to the Other Bird-Lover, who has a book, a pencil and an air of suppressed excitement which makes the pencil move very rapidly. On we walk, leaving Snyder behind, until we have no more birds to investigate. Then my companion beckons and shouts, "Come!" and our clever nag trots ahead to us and stops to take us on board.

Sometimes we take observations from the sleigh or carriage, if we are too well tucked in of a cold windy morning to wish to brave the elements in the deep woods. And so it happens that with Snyder's aid we have been able to comfortably see some rather rare species this winter.

On the 9th of January, on the easterly edge of some thick woods, when there was a brisk northwest wind, we plainly saw four brown creepers (*Certhia familiaris fusca.*) Two were crawling in spirals up the tree trunks; two more were flying across the road. This is our latest record for Certhia, and shows that the birds are wintering here. A few feet farther down the road were twelve golden-crowned kinglets, restlessly pecking at the buds of some gray birches. This bird (*Regulus satrapa*) wears his yellow headfeathers all the year round; his wife, unlike the females of their ruby-crowned cousins (*R. calendula*) carries

a paler reflection of her mate's gorgeousness on top of her head. It is a comfort to find the *mother* wearing a visible coronet, for so often with birds (as with people) the mother's crown is witheld, the dear little creatures go on carrying their domestic burdens with no apparent glory of reward, save that appreciation which we hope exists in the hearts of their mates. So I think it must thrill the chivalrous spirit of this little golden-crowned king to have his wife's stripe of glory as much in evidence to the world as it is to him, and that he is glad to know that his Lady Regulus has the outward, visible sign always on her queenly little head. May I often have the chance to salute her golden coronet.

The ruby-crowned kinglet (Regulus calendula) does not winter with us, but is often seen with the golden crowned, in migrations. Snyder carried us directly into a flock of both on October twentieth, (1901,) when the birds were flitting around the low birches. Fearless little creatures, one cannot see why they frequent the pine tree tops now, unless it be for the love of the winter sky. Why not come down to earth, oh Kinglet, and live with us on our sheltered acre, and try a diet of raw bones and frozen suet, along with our two nuthatches and two woodpeckers? You would there have two ardent admirers gazing at you from the house, and Snyder to whinney at you from the window of his box-stall, and, after all, the same sky over you.

Chicadees and goldfinches were on the sheltered side of these same woods on this brown-creeper, kinglet day. Both birds were giving their characteristic calls, and talking away to their neighbors, quite like women at an afternoon tea. So here were four rather rare birds seen from a sleigh in one morning. Encouraged by our success in a few days we went to the same spot, and this time Snyder stopped under trees where there were strange birds to us. We could hardly believe our Bausch & Lomb, yet there they were,

the Canada Jays, (Perisoreus canadensis,) a pair of them. Such fluffy, bunched up birds, which looked like feather balls when they flew from tree to tree. They were not in the least afraid of us, and only flew a few feet at a time. They posed for us in as many different attitudes, and as willingly, as a society girl before the camera. We saw them plainly and have not the least doubt of their identity. But one friend said, "I would like to see your Canada Jays stuffed" and the inference was that then she would believe. Other friends said "Shrikes," but had this been so would there have been kinglets in the same trees calling out their fine "*ti–ti—ti–ti*?" Would nuthatches have been "yankling" in a neighboring dead pine? And would a downy woodpecker have kept at his hammering so unconcernedly in the presence of this deadly foe? The late lamented bird collection owned by the Institute contained a specimen of Perisoreus canadensis shot near Bedford some years ago, and to it we went later for verification of our morning's discovery. We obtained what we wanted, and were told by an onlooker that he had had these Jays reported from Concord. Hardly had we put the specimen back in the case and locked him up there for safety and future generations when the fire alarm rang, and soon the Jay, his case, his rooms and his very house were consumed in the flames, and for aught I know his ashes may be in the dust which the west wind is blowing through the cracks of my rattling window this very moment.

Snow buntings (Plectrophenax nivalis) on January 12th, at least one hundred and twenty, rewarded us for a cold drive over the newly fallen snow. Snyder stopped just opposite them, and not over twenty feet away. The birds rolled around in the light snow, they dived in it, making it fly in their fun; they chased each other, now on foot, now in the air, and acted altogether like a company of children bathing in the surf. Then they all flew off in a whirl

to a distant seed patch, while we put down our glasses, looked at each other and gasped, "*Well!*" in the commonplace way people do just after they have seen an unusually attractive thing. The snow bunting is not a common winter bird with us, we usually see but one or two flocks in a season.

Tree sparrows were more plentiful in our usual drives last year than this and true to the full-fledged ornithologists' statement, which avers that you can't see birds from a carriage, you have to tramp the quiet small woods to see Spizella monticola, now.

American Mergansers in their old haunt in the Merrimac below Goffs Falls, very small flocks of crows, larger ones of chickadees, a few nuthatches, downy and hairy woodpeckers, tree sparrows, snow buntings, and blue jays, with the foregoing kinglets, brown creepers, gold finches, and the two Canada jays complete our January list of birds. All but the tree sparrows were seen from the sleigh or carriage.

The shrike we have yet to see this year. A friend of mine asked me what large bluish-gray bird an English sparrow would attack. Said he had seen one fighting a gray bird as large as a robin, and the sparrow was pecking it fearfully in the throat. He seemed amazed when I said he had probably seen a shrike who had just captured a sparrow in its claws, and that the latter was fighting for its life. "And I had thought it the other way around," he said.

DREDGING FOR "QUEER STICKS."

Photographed for Nature Study by Mrs. Edith S. McCoy.

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Some Queer Sticks. II.

BY EDWARD J. BURNHAM.

The first thing the tiny Caddis-fly larva must do, after getting out of the egg shell, is to set about building a house. Most other insects have a hard covering over the entire body, but the ancestors of the caddis-flies have lived in houses so long that this covering has nearly disappeared. The head is still covered with it, and generally the three joints or segments next to the head also. These are the joints that have the three pairs of legs attached, and together are called the thorax. Sometimes one or two joints of the thorax are naked, as well as the remainder of the body, and as caddis-flies of the same kind always have the same number of segments covered or naked, boys and girls when they learn this, find it real fun to gather the different kinds and assort them, just as a grown-up entomologist would do.

But whether he has a hard, reddish jacket of one, two, or three segments, so much of his body is still naked that the little insect must build a house at once. If his father and mother lived in stone houses, he begins with the tiniest bits of gravel he can find and, before he is two days

old, has a nice little tube to live in. If his "folks" before his time, lived in wooden houses, he gets bits of twigs or grass, and fastens them together. Whether he builds of stones, or sticks, or grass, or leaves, he keeps adding at one end, making his house longer as he grows bigger, and some day the small end, where he first began, breaks off, or he breaks it off. It must be broken off in some way, in order that more water may flow through the tube, as the insect increases in size. For all creatures must breathe in order to live, and the caddis-fly larva can get only so much air as is brought in the water that constantly flows through his tube. If a caddis-fly, in its case, is placed in a dish of water that is not quite clear, the little current can be seen flowing in at the front end of the case and out at the hind end.

When the caddis-fly larva is full grown, and is about to go to sleep and change into a pupa, it usually stops up the hind end of the tube, and weaves a nice, open-work net across the front end, which will keep out its enemies, and still let in a little fresh water while it sleeps. By and by, when it has changed a great deal, it wakes up, opens the door and leaves its house forever. It crawls out of the water, its skin cracks open, and it comes out a graceful creature with four wings and long, slender "feelers" or antennæ. It is a quiet little creature, resting on twigs a great deal, mostly near the water where it passed its early life stages, and where it lays the eggs that will hatch out more tiny house-builders. It lives only a few days more, flies but little, and then more by night that by day, so it is rarely seen except by those who go to look for it.

It is while the caddis-fly lives in the water that it is of greatest interest to boys and girls, as well as to scientists, and as some kind is certain to be found in almost any bit of fresh water, during winter, spring and early summer, it is easy to observe it in its natural situation or to collect it,

and study it at home. The kinds that live in still water can be kept alive for a long time in a dish of water that is changed occasionally, and if bits of grass, twigs or leaves are placed in the dish, many interesting things may be learned about its house-building. The illustration above, shows how one little boy collected caddis-flies last winter, with the help of a dredge made of perforated tin from which the water could escape, leaving the queer sticks to be picked out and carried home.

Legends of the Poplar.

BY SUSY C. FOGG.

It was supposed, in ancient mythology, that the oracle could be heard speaking in the voices of certain trees, and divine guidance was often sought from such a source. Today is not an age of tree worship, but we practical, unimaginative people are yet glad that there are forests to control the rise and fall of great rivers, to act as a windbreak in the cold winters, to temper the heat of summer, to enrich the soil, to shelter the birds, to purify the atmosphere, and to become objects of beauty in the landscape, and familiar landmarks, endeared to us by rich associations. We are coming to understand these things as our psychic faculties are broadened toward a better appreciation of the setting amid which our lives are placed.

Poets and painters have revelled in the giant oaks, the singing pines and the transparent birches; and many of the pretty legends and superstitions of the far-away time still linger in literature, and the trees themselves seem invested with much of the old charm that belonged to the supernatural.

"The poplar that with silver lines his leaf" is wrapped in mystery and legend, and its quivering leaves and famil-

iar voice are supposed to signify sorrow for past wrong-doings. The very slender petioles by which the leaves are attached are compressed laterally in several species, as the American aspen and black poplar, causing the leaf to be in almost perpetual motion; but the Highlanders of Scotland believe that the holy cross was made of wood from this tree, and that its leaves are never allowed to rest. Impressed by the horrors of the crucifixion, they are still unable to suppress their agitation.

The glittering lights produced in the foliage of the white or silver poplar by this twinkling of the leaves is like only unto the silver luster on the ripples of a lake by moonlight, to which it has often been compared.

"Phaeton, son of Helios, the sun," was presumptuous and ambitious enough to request his father to allow him for one day to drive the chariot of the sun across the heavens. His father granted the request, but the youth was too weak to check the horses. They rushed out of their usual track, and came so near the earth as almost to set it on fire. Thereupon Zeus, the supreme god in Greek mythology, killed him with a flash of lightning, and hurled him down into the river Eridamus. His sisters, who had yoked the horses to the chariot, and had wept and mourned for their lost brother, were metamorphosed into poplars and their tears into amber. "Who fails, who knows the story, to think of the slender, girlish figures of the weeping sisters as he watches and listens to a row of the Lombardy variety?"

The Lombardy poplar is a strongly marked tree in contour, its lines being chiefly perpendicular, but is not ungraceful, and a rural scene is recalled to mind where these poplars reach heavenward, like the twin spires of a cathedral, before an old red house and other more flattened tree forms by which it is surrounded.

Of course there is a legend to explain this upward-

reaching tendency of its branches. Someone had stolen the pot of gold which is said to be at the end of the rainbow, and the wind-messengers were sent to search for it. The elm, the oak, the pine, and all the trees, were asked if they knew the thief. All pointed their leaves toward the poplar, saying, "The poplar knows, the poplar knows." "I know?" said the poplar, raising its hands in pretended surprise, "but how should I know?"

Just then the pot of gold was seen shining through its leaves, and as a punishment the wind-messengers decreed that it should forever hold its arms in just that position, a warning to all other trees to be honest!

The poplars are somewhat apart from the conventional type of trees, but the richness of foliage, both in texture and color, their smooth, handsome trunks and the constant rustle of their gossipy little leaves, one upon another, would seem to make them the most sociable of trees and much to be admired, but appearances are sometimes said to be deceitful!

A Plea for Our Native Wild Plants.

BY FREDERICK W. BATCHELDER.

A quaint Spanish song tells us how a flower once loved a butterfly, and how, in her intense longing to join her heart's mate, fluttering wantonly by, she cried out piteously, "Either take root like me, or let me fly with thee!"

Doubtless the thought in the poet's mind was of a human love, the love of some peasant maid for a lord of high degree. Yet, if plants could think, I doubt not they would many a time be seized with a desire to be freed from earth, like the butterflies and the birds, and so escape some of the dangers that beset them.

For man, the only animal that wantonly destroys, has become their worst enemy. His selfishness may undo in a

day the work that it has taken kindly nature years, decades, centuries, even milleniums to finish. John Muir tells us of gigantic trees, in our western forests, which were already hundreds of years old, possibly a thousand years old, when Moses led the chosen people out of Egypt. He also tells us how some of these noble relics of the past were cut down solely for the purpose of giving a party of novelty seekers a chance to dance upon the stump and tell about it afterwards!

The gift of beauty has been fatal to many of our birds. Man, selfishly regarding only present gain, has nearly or quite exterminated some of the most interesting species and seriously diminished the numbers of many of the commoner species. An awakening sense of sympathy has at last put a check on the wanton destruction of birds. Ornithologists, bird lovers, sportsmen, agriculturalists, have combined their forces with such success as to influence public opinion and secure protective legislation from many of the state governments and also from the national government.

As with birds, so with plants, the gift of beauty is likely to be fatal, and if, in addition to beauty, they also possess the gift of rarity, the doom of extinction is imminent. Man has cast his evil eye upon them. He must have them, he will have them, and he gets them! The market must be supplied with wild flowers, no matter whence they come or how they are obtained. Country boys and girls must turn an honest penny by the sale of nosegays, though whole neighborhoods or sections may be devastated. The herbarium must be supplied with the rare fern or orchid, even if another of the kind may never again be found in the vicinity.

So the necessity is upon us, true lovers of flowers and of plants, to initiate some reform in the relations of man to the plant world corresponding with that which has already been so successful in his relations to the bird world. Public opin-

ion must be influenced in behalf of the conservation of our flora as well as any of our fauna. Ignorance and thoughtlessness can be combated with the weapons of information, and kindly advice : with these two important factors eliminated, the other two, malice aforethought and pure selfishness, will be exposed to view, and may then be more easily controlled by legislative enactments.

A move in the right direction has recently been made by the formation in Boston of a Society for the Protection of Native Plants. This society has already issued a leaflet which has received the cordial endorsement of the New England Botanical Club, an organization which has for its object the study of the flora of New England, and which is, of course, specially interested in the preservation of the native species. The leaflet sets forth in very plain language "the great danger of the partial or complete extermination of many of the most attractive forms, in the neighborhood of our large cities, from the wholesale destruction to which they are subjected." It names more particularly "the extensive collection of flowers for sale," "and the thoughtlessness and wasteful extravagance in the picking of wild flowers, especially when at the same time, the roots are pulled up, as is too often the case."

It states the fact that, in Connecticut, laws have been passed, looking to the protection and preservation of the Hartford Trailing Fern, (Lygodium palmatum,) and the Mayflower.

It urges as the first principle in collecting that the flower, or branch, or stem should be cut, not torn, off, lest the root be pulled up, and the plant thus mutilated so that further growth is completely or partially, checked. It then goes on to name some of the plants which particularly need protection in the vicinity of Boston. I will name only those which may be found in this vicinity. They are the Mayflower, Mountain Laurel, Ground Pine (Lycopodium,)

Maiden-hair Fern, Fringed Gentian and all beautiful Orchids.

It may seem absurd to those who have seen the mayflower in great abundance in some of our neighboring towns, that there can ever be a scarcity of those dainty heralds of summer. Yet it is a fact that it is nearly exterminated in the vicinity of the cities; it is a fact that enormous quantities of plants are wasted or destroyed in the process of gathering; and it is also a fact that, like most of the heath family, the species is of slow growth, practically impossible to cultivate, and, in consequence, peculiarly liable to extinction. Its production of dimorphous and trimorphous flowers is also an evidence that it is having a hard struggle to maintain itself against all competitors.

The case of mountain laurel is similar. It belongs to the same family, and is doubly unfortunate in that the beauty of its bloom and of its leaves causes two annual attacks to be made upon it, one when it is in flower and another at Christmas tide.

Anyone who has searched for the maiden-hair fern in this vicinity will testify as to its rarity at the present time. Yet the memories of persons by no means aged, can recall a time when, if not abundant, it was far from rare. The same with the lovely fringed gentian. The same with some of our most beautiful orchids. There was once in Manchester a station of the northern white-fringed orchid (Habenaria blephariglottis.) Where is that station now? Gone with Hans Breitmann's "barty!"

Dear friends, the moral of this plain tale is just this: Please do all you can, by your information and your advice and, above all, by your example, to dissuade collectors of plants and flowers, whether scientific or unscientific, from abusing the privilege of nature and needlessly marring the gifts of God. Our native wild plants are a gift He gave us. Their passing away by our fault will be a loss which can never be made good, even by repentance.

Gulls and Terns of New England. II.

BY W. R. VARICK, M. D.

All of our gulls but one belong to the genus Larus, but here, in accordance with our color classification, must be ranked the distinguished exception, the Kittewake (*Rissa tridactyla.*)

He is a little fellow, sixteen inches long, who visits our coasts commonly in winter, a fairy in white from the realms of ice. The gray mantle and black tipped primaries do not show, unless one sees this sprightly beauty close at hand, and the dark ring around the eye, which he assumes in winter does not mar the purity of his snowy garb. Yet he has the constitution of the hardiest old salt afloat. Equally at home near shore or in mid ocean, he sports with the hardest gale, or sleeps comfortably, with head under wing, on top of the stormy winter seas, feeding on anything he can get, and like most gulls drinking salt water in preference to fresh. They nest in colonies on the shores of the Arctic Ocean.

This bird is a familiar friend of the fishermen who follow their calling in winter on the shoals off shore. They flock around the schooners for the fish refuse that is thrown overboard. The books say that Kittewakes can always be identified by the rudimentary hind toe. This is a very important fact for us opera glass cranks, very fortunate indeed.

The next class of gulls includes those having black or slate-colored heads in breeding plumage. There are only two that visit us often enough to be counted. Bonaparte's Gull (*Larus philadelphia*) comes along to the coast as a spring or autumn migrant, and is occasional as a winter visitant. He is the smallest member of the family we have, only fourteen inches long, and, like well-mannered children, he is pretty, friendly, not very noisy, and altogether

attractive. At St. Augustine, in March, I have stood upon the sea-wall and studied a flock of them, not forty feet away; now resting lightly on the water, now playfully chasing each other along the shore, or foraging for bits of food that might have escaped the sharks which abound both on land and sea.

In summer Bonaparte's Gull has a dark slate-colored head and throat, but in winter these parts become a dusky white. The back and wings are pearl gray, with black patches near the ends of the primaries, and the tail and under parts are white. The breeding range is North America, north of the United States, but they confine themselves to the central and western portions, there being no breeding records for the Atlantic coast. Bradford Torrey says they should be called surf gulls, from their habit of flying low over the waves where they break on the shore, darting into the tops for bits of food or small fish.

The Laughing, or Black-headed Gull (*Larus atricilla*) is the southern representative of the family. The first name is earned by the weird cry, a wild, sarcastic "Ha! ha! ha! ha!" that he gives when excited. He has the slate-black hood and chest protector, which change to a mottled gray in winter. The back and wings are the usual pearl gray, the primaries black; elsewhere he is pure white. Immature birds of this, and the preceding species, have a black band across the white tail near the tip, which makes their identification easy. The breeding range of the Laughing Gull is Central America and along the Atlantic coast to Nova Scotia, but as far north as New England he is only common locally. He is a great favorite of mine, probably because in my early ornithological days I studied him at long range for several days before making up my mind as to his identity. So I always salute him with Rip van Winkle's toast, "Here's to your health, and your families'. May they live long and prosper." He is

a great beauty, and comes to us in a season when one has the most leisure and inclination for enjoying his visit.

The last class of gulls may be disposed of in a word. It is made up of the huge Burgomaster (*Larus glaucus*), the Iceland Gull (*Larus leucopterus*), and Kumlien's Gull (*Larus kumlieni*). All are birds of the far north, arrayed entirely in white and gray, in tone with their surroundings of snow and ice. They are occasional visitors along the New England shores in winter.

THE TERNS.

Terns, like gulls, are distributed over the greater part of the globe, though not showing the same fondness for high latitudes. They have wide domains, a single species often including several oceans and continents in its range. In plumage nearly all our terns are very similar, though differing in size; all have black crowns, pearl-gray wings, with or without black markings on their primaries, and white or gray underparts. The Black tern belongs to a different genus, and differs in plumage, as I shall explain later.

There are only four species that require much attention, for no others breed in New England, though several other species appear as rare migrants or accidental stragglers.

Wilson's, or the Common Tern (*Sterna hirundo*), used to be abundant on every shore and in every bay. Sea swallows they are called, and are among the favorite birds of all who have made their acquaintance. So popular and beautiful are they, that most of them have been induced to change their habitat, and now pose calmly on ladies' head gear, in attitudes that must make their poor ghosts dizzy when they happen to run across their late earthly abodes. They reach our coast in May, and soon congregate at the home of their forefathers, on some island or rocky shore, and prepare for housekeeping. In August and September old and young gather in large flocks for social and educational purposes, and, soon after, the south-

ern journey is begun, most of the birds going south of the United States. The range of Wilson's Tern includes the greater part of the northern hemisphere in America, breeding locally from Texas to Greenland, inland, as well as on the coast.

The Arctic Tern (*Sterna paradiseœa*), as the name would imply, is the northern species, breeding from Massachusetts to the arctic regions in North America.

The Roseate Tern (*Sterna dougalli*), though having a wide range, is in America confined to the Atlantic coast, from Florida to Maine, wintering in the tropics. It is a shyer bird than the two preceding species, except when nest or young are in danger. These birds are all about 15 inches long, though the tails of the Arctic and Roseate Terns are longer and more forked than the Common's. The Roseate has also a pinkish tinge on the white breast during the summer. The Common Tern has a red bill with a black tip. The Arctic's is all red and the Roseate's, all black, but the matter of differentiation of these three terns by lawful opera-glass methods is extremely difficult.

The question of comparative size and dimensions is one that no two observers can ever agree about. The bird will not keep his bill still, and sunlight and shadow make it turn from red to black in very tantalizing fashion. In the fall the bills all become black and the foreheads white, while the immature birds complicate matters by getting black patches on their hitherto white heads, and showing black bills that to one's expectant eye look very roseate.

Amorphophallus Simlense.

On the evening of March 18, the botanical section of the Manchester Institute, in addition to its regular work, dissected and studied the blossom of the Amorphophallus simlense, an exotic plant belonging to the arum family, advertised in a few catalogues, and cultivated for its oddity. Like a few other allied species, it blossoms first and afterwards sends up leaves.

This particular specimen had a blossom growing from a stem about an inch and a half in length, nearly white and mottled with purple. The spathe was fourteen and three-fourths inches in length and about two in width at the widest part. In color, it varied from green on the outside to a cream color on the inside near the base, beautifully spotted with dark red and purple. As it opened, it fell over, and hung like a banner suspended at half mast and waving in the breeze.

The spadix, of a dark purple color, was twelve inches and a half in length and about a third of an inch in diameter. Three inches from the base was an encircling ring of staminate flowers ; at the base a similar girdle of fertile flowers. Just above the latter there were a few scattered stems, evidently the branching of fibers or ridges of the spadix, terminating in small ellipsoidal knobs that had the appearance of being nectar glands.

The only disagreeable feature of the plant was the odor which came from the upper portion of the spadix. This organ, projecting above the rest of the plant like a miniature flagpole, was suggestive to the nostrils of decayed flesh. This property has a use in the home of the plant in attracting flies which crawl about after pollen and honey,

and reciprocate by fertilizing the plant. Although the blossom examined had been open but one day, when the spathe was cut open a bluebottle fly was found imprisoned in the nearly closed base. This survivor of a New Hampshire winter had been aroused by the warmth of approaching spring and had gone where a familiar odor had attracted.

The insects that alight on the sterile flowers are enticed below by a different odor, and find themselves searching for honey and distributing pollen at the same time. The nectar glands exhale a most delightful perfume, delicate and lasting. One little gland, barely larger than a pinhead, impaled upon a needle, gave out an appreciable perfume, and an hour later the odor was perceptible upon fingers that had handled them. The plant is a curious instance of adaptation to environment and of specialization approaching that of orchids.

The Secret of the Closed Gentian.

BY DOROTHY MAY.

To Sweetwater Brook on a September day for closed gentian. The road goes high over the brook, which "slips down through moss-grown stones with endless laughter." On a little island above the bridge, there are tiny feathers scattered—fine, silky feathers, with a hint of green and gold. The tragedy is easily read. A hawk or shrike dashed down npon some dainty warbler, perhaps a Maryland yellow-throat, and then, perching on the sapling that bends over the stream, tore it to pieces. So much of grace, and beauty, and melody gone to make a feathered cannibal's dinner. Oh ! the pity of it !

The brook is so low one can step from stone to stone under the bridge. On a shelf of rock there is a four-storied

phœbe's nest. One nest set in another, like a pile of saucers, or like an inverted Chinese pagoda. An ideal place for a house, as Mrs. Phœbe had evidently thought, four springs in succession. No cat, skunk, weasel, snake or squirrel could ever climb that smooth stone wall to reach it, and no bird of prey could swoop down upon it; it was sheltered from wind and storm, and winged food buzzed at her very door.

Out in the light again, the brook was deeper, and one must take to the bank and push through the dense growth of tree and shrub. And here is an example of Nature's perfect arrangement of color, and of the paramount value she puts on environment. For here are cardinal flowers, flaming like torches in the dense shade of the alders, rooted in black moss in the middle of the dark water. Who ever saw cardinals growing in sunlight, except where man had interfered with the setting of Nature?

A little farther down, in a bit of sun-lit meadow, are great knee-deep masses of the gentian. As some writer has described them, "With bright, rounded buds, looking from day to day as if just ready to open, but they never will; they are *closed* gentian." Mrs. Parsons calls them "Deep-tinted flowers, firmly closed, as though to protect the delicate reproductive organs within from the sharp touches of the late year." Alice Lounsberry says: "Of course there is a great deal of theory in its closed corolla; it protects its delicate organs from the cold of the late season, and all other evils to which they might be subjected." And F. Schuyler Mathews: "There is quite a difference of opinion among botanists as to whether the closed gentian is subject to cross-fertilization, or simply fertilizes itself; Gray thought the former was the case, and says that he has seen a bumblebee force its way into the corolla; but Dr. Kunze concludes that the flowers derive no aid

from insects. This only shows how much there is yet to be learned about a common wild-flower."

How this sly rogue of a gentian must have been laughing to itself all these years! But today its secret is out. Here are five or six, at least, little velvet-coated lovers, looking, to an unscientific observer, just like bumblebees, except that they are a third smaller, going steadily about their work of cross-fertilization, and utterly oblivious of a spectator.

One hovers over a cluster, looking with practiced eye; yes, there is a bud at the right stage of development. He alights and pulls and tears it open at the top. It divides naturally into five petals a little way down, and he pushes in, clear out of sight. The bud closes smoothly over him, and, except for a suspicious fatness and top-heavy swaying, it looks perfectly innocent. Now he is backing out, kicking and struggling, his fur all turned the wrong way, and covered with pollen dust up to his eyes. Away he goes, to another cluster, to repeat the performance, and mix the pollen.

It is perfectly easy; after watching awhile, to tell which flowers have been visited and torn open; and what an intense delight to have thus discovered the secret of the closed gentian!

Among the influences which have helped forward the recent rapid growth of interest in nature study the camera must be accorded a place well toward the top of the list. The history of the camera has been from in-doors to out of doors—from photographing objects in nature to studying and loving them. The *Camera*, a monthly magazine devoted to the advancement of the amateur photographer, is doing a splendid work along this line, and is among the most welcome of our exchanges. Published at 114–120 South Seventh Street, Philadelphia. $1 a year.

A Record of the Past and a Prophecy of the Future.

BY WILLIAM H. HUSE.

In a sense, everything that grows is a record of the past and a prophecy of the future, but it is not always that we see on the same plant the fruit of last year's flowering and this year's inflorescence at the same time. We find all this on the alder in early spring. Last year's blossoms were fertilized by the wind, matured and gave way to the little green knobs gathered in growing clusters on the ends of the twigs. These spent the summer in growing, and then, when the winter winds blew cold and all nature curled up to keep warm, the alder cones were ready to uncurl and spread their seeds on snowdrifts in field and wood. How much like little cones they look! Not all are perfect. The elongated scales are leaves which did not succeed in being metamorphosed into perfect scales. Every part of the cone is of interest, and well worth study.

It is not the cones, however, which alone would attract much attention. Before they have unloaded all their seeds the buds for this year's blossoms will have developed and opened. They are open at this date, among the earliest of the spring flowers in New Hampshire, if not the earliest. The pendent catkins of the staminate flowers are the curls with which girls trim their hair and hats. Swinging gracefully in the breeze, they are the banners of the approaching army whose vanguard is but a few days behind. How daintily they flutter in the wind and shake down gold dust from their *el dorados* into our outstretched palms.

Above the catkins are the smaller and less conspicuous pistillate flowers. The delicate, little, dark red stigmas

make a brush of almost microscopic fineness. But how can these flowers get pollen when they are above? Nature is wise. They do not want this pollen but some from another bush, and they get it. The wind brings it.

The alder blossoms come and go. Comparatively few stop to admire their simple beauty. They are worthy of all the admiration they get, however, and more, for are they not among the pioneers of spring?

A Pet Squirrel.

Editor of Nature Study:

Perhaps you would like to hear about a little squirrel that we made a pet of last summer and fall. He is a red squirrel, with three children. His summer home is in a large chestnut tree, and his winter home is under our verandah. His summer home has two doors, a back door and a front door, and it is lined with feathers that he got from our attic, where he tore open a feather spread. Although he never would come near us, we had great fun watching him. About eight feet from the ground, on his tree, there is a short branch on which he often sat. One day I took a little wire basket, fastened a string to it, and a stone to the other end of the string. Then I filled the basket with nuts, threw the stone over the branch, and up the basket went. Then I went into the house to watch him. Pretty soon, along he came, very cautiously at first, but he soon grew bolder. When he reached the basket, he took out, one by one, the nuts we had put in and carried them to his home. But the second and third time he upset the basket purposely, taking it in his teeth and turning it over so as to dump the nuts out, and then ran back chattering and scolding to his home. We soon found out that he never put the nuts, figs or grapes we gave him, into his summer home, instead he took them all under the verandah, where

he was often seen scampering around. One day when all four were running about in the tree one of the smallest fell to the ground. Of course they raised a great commotion, running up and down and chattering in the most pitiful manner, but he got back all right again. One day all of them moved under the verandah and we have not seen them since, but I hope to in the spring.

CHRISTINE E. GAYLER.

Ridgewood, N. J. March 3, 1902.

"The First Robin."

The fact that robins winter about Manchester, N. H., has generally been discredited, or at least believed to be of rare occurrence, and the latter is undoubtedly true, numerous reports and newspaper stories to the contrary.

This winter, however, it seems probable that one or more individuals have wintered with us, as the lively chirrup and glimpses of the bird in question have frequently been reported by bird-lovers, and on January 14 a robin was seen by one of our most accurate observers and other witnesses.

On March 10 a redbreast was seen chirping and flying about on the Smyth Road, in the same animated manner as if enjoying his first April shower. It seemed early for *new* arrivals; yet, why did he stay?

Did he know that there would be sufficient bare ground to furnish him subsistence through the long winter? Or did he have a mind to go when he pleased, or in time of want? Was he a young bird that had strayed from the flock at migration, and dared not venture on the journey without a leader, or did he believe that all advantages would come his way by being on the ground when the next mating and housekeeping season returned? S. C. F.

Female Bird Songsters.

A communication in our last number (March) concerning the songs of female birds was very suggestive. It is to be hoped that all persons interested will make observations and preserve notes on this subject. So far as my personal observation goes the female purple finch is the princess of female songsters. I was greatly puzzled when first I heard the song in spring, and chased several birds for hours, supposing them to be some species of sparrow, possibly Lincoln's sparrow, hitherto unknown to me.

The song is usually soft and sweet, a sort of tranquillized edition of that of the male finch, less rollicking than his, more self-contained and spiritual. Sometimes, however, she mounts the topmost branch of a tree, and gives forth an original strain, loud, full and rich, in form resembling that of the swamp sparrow but more resonant and brilliant.

With regard to the song of the female veery, mentioned by our correspondent, I cannot help suspecting that a male bird was practicing some of his tricks in ventriloquism, in which art he is an adept. I have often heard the song of the same bird from different distances, and have been surprised at finding that the nearer I was to the bird the softer seemed the song. Close at hand it had a muffled effect, while at a distance it made the woods ring with echoes.

Many female birds warble very sweetly in the nesting season answering thus the more brilliant calls of their mates. We have especially noted this in the case of the yellow-throated vireos, who build and breed in the trees quite near our windows. F. W. B.

SANGUINARIA CANADENSIS. (Bloodroot)

Photographed for Nature Study by Edward H. Fogg.

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"They That Are Pure in Spirit."

BY SUSY C. FOGG.

Faith has kept us whole while the winter months have sped away and the Glacial Period, that seemed to return upon the earth and struggle for its old-time mastery, dissolved in melting drifts and running brooks, and the procession of wild flowers halted. But one day the buds pushed out on the arbor vitæ and opened wide, the sturdy skunk cabbage, closely wrapped in his pointed hood, appeared in the lowlands, and the willow pussies crept out to sun themselves upon the twigs.

There came another day, a wonderful Easter day, which brought a message to the maples and the willows, the alders, and all the little flowers, waiting with scattered ranks, to awake; the great procession moves which shall gather glory and increase its hosts while the season of "the passing show and the last leaf" is yet afar off. And in obedience how the maples have reddened, the willows have grown golden, to the delight of swarms of bee lovers who danced attendance, and the mayflowers have fringed the sunken rocks in the old pastures. Many a cluster,

tinged with the pink that had not yet faded from the cheeks of the fair young Puritan girl as she knelt lovingly over these flowers in that spring of 1621 and called them mayflowers, thinking all the while of the old English thorn, the good ship that brought her to this shore, and the fidelity which could alone sustain. Every spring, she looked for a renewal of her strength with the coming of the mayflowers.

The anemones have surprised the passer-by; the fern roots have waved aloft their crosiers; the yellow violets have not bloomed unseen; even the sober sweet fern has done its best; the marsh marigolds have glistened in the run, and the nodding hepaticas, rising from a bed of chestnut leaves, have fairly laughed at us out of their darling blue and purple cups.

While the message of the Easter tide summoned the vast woods and fields, it also called a homely clod under shelter of a friendly spruce, and there has come forth a flower, no more welcome than the rest, but I pause and wonder if there were ever anything more chaste and spirituelle, though it lies bleeding from its broken stalk upon my hand. A strange occurrence, that seems to make the plucking of this flower inhuman. Was there some human clay incarnate in its perfect form and purity? A gruesome thought, and yet, again, how beautiful! It might be true. It has been sung

> "that never blows so red
> The Rose as where some buried Caesar bled."

In the wanderings of Æneas, as he landed upon the shores of Thrace, thinking to build there a city, he prepared to offer sacrifice, breaking large twigs from the cornel thicket near by. To his dismay, drops of blood fell to the ground, and upon repeating the act, the voice of Polydorus cried out to him, "Spare me, Æneas! I am your kins-

man, Polydorus, here murdered with many arrows from which a bush has grown, nourished with my blood."

In the month of April, 1775, a handsome young English soldier was laid to rest on American soil, and a great and imaginative mind pictures how a stately flower took root in the bed of crime and, in due time, covered the mound. "Day after day the strange crimson flower bloomed more and more abundantly, until it seemed almost to cover the little hillock, which became a mere bed of it, apparently turning all its capacity of production to this flower; for the other plants, Septimius thought, seemed to shrink away, and give place to it, as if they were unworthy to compare with the richness, glory, and worth of this their queen. The fervent summer burned into it, the dew and the rain ministered to it; the soil was rich, for it was a human heart contributing its juices—a heart in its fiery youth sodden in its own blood, so that passion, unsatisfied loves and longings, ambition that never won its object, tender dreams, and throbs, angers, lusts, hates, all concentrated by life, came sprouting in it, and its mysterious being, and streaks and shadows had some meaning in each of them."

The flower that was real to me was the Sanguinaria, Red Puccoon or Red Indian Paint, and was much used by the Indian to stain his person and utensils. Since the brave fight made by the young farmers against the Indians in 1745, its star-scattered hosts have clothed the New England battlefield. The arrow heads have long ago sunken into the earth, peace has fallen upon it, and in the pure white blossoms time has hallowed the strife and sorrow, if never healed.

And if the name Sanguinaria or Bloodroot has been applied to this flower, perhaps not inappropriately, though the highly colored sap which exudes from stem and root is bright orange rather than crimson, yet not so much of in-

terest centers in this tendency as in the beauty of the flower. I look into the heart of one and see there its "bridal ring of purest gold," surrounded by a double cross of pure white petals. The petals may occur pinkish, and eight to twelve in number, arranged in two or three "sets," but it loves the cruciform pattern.

It is only a step from sanguinary to sanguine, words of allied derivation, and the meaning, abounding in blood, comes to signify life and animation, and if full of life, why not hopeful? There was precious blood shed upon the cross, but out of it came hope.

There are symbols in my little Sanguinaria of only that which has a right to exist there, and if it has known sin, it has conquered, which is a greater victory than to have lived apart.

First Signs of Spring.

BY EARLE FOSTER STAFFORD.

Early on the morning of February 16, I arose while yet the stars were shining brightly and the hushed silence of night still prevailed. As I entered a large tract of woodland half an hour later, a gray light shone indistinctly along the eastern horizon. Gradually the stars grew less brilliant, and finally, became wholly invisible, as a rosy hue to the eastward gave promise of sunrise.

The first bird note I heard was the hoarse "chirrup" of some early rising English Sparrow, and it was soon followed by a chorus of answers from other street sparrows on every hand. At 6.25 the lisping calls of Golden-crowned Kinglets were heard, as a band of about six of them gleaned rapidly for their breakfast among the bushes and low trees,

I know of nothing more active than a troop of these sprites now dropping to the ground after some fallen larva, like

a bit of soft green velvet, now swinging to a slender twig, or remaining in front of some crevice on vibrating wings, and now flying to the next tree as if blown by the wind.

At 6.30 a crow flew overhead, hailing the day with his strong, masculine "caw," as he settles on a tall pine tree, whose slender terminal branches bend beneath his weight. He was soon followed by several others, and together they descended to the wet meadowland to feed.

The sun now swung clear of the tree-tops, and as I stood watching its golden rays reflected on the hillside near-by, a Blue Jay's bell-like "Oely, yoely" floated to me from the cool depths of a hemlock grove. This melody is one of the first and surest signs of approaching spring. A loud tattoo suddenly sounded from the oaks, and on going over I saw four Flickers which were bowing and chuckling to one another near the top of a tree. After that, at different periods of my stay in the woods, I heard the Flicker drum his promise of the coming season.

During this time of excitement, Creepers, Kinglets and Chickadees were filling the air with notes of contentment, as they neared the finish of their morning meal.

I now went in search of a reliable and solitary tenant of these woods, White-breasted Nuthatch, the only one I find remaining constant during the midwinter months. I finally found him, guided by a peculiar laughing call, which at first I though to be the "wick, wick, wick" of the Flicker. The Nuthatch was sitting still on a horizontal bough, and when he uttered the call he extended his neck slightly, giving it out with a nasal twang. It was somewhat similar to his common "yank," given in rapid succession, as "yank, ank, ank, ank, ank, ank." This was his expression of spring feelings.

I now turned my steps toward Cambridge, and in crossing the Charles river I saw a great many Golden-Eyes, with a few Black Ducks and two Herring Gulls. This latter

species is rare now, having mostly gone to its northern breeding grounds. The former, however, is very numerous.

In a small patch of Cambridge woods, a Blue-Jay was hopping stealthily about in an old apple-tree, very difficult to see in spite of his gaudy plumage; and in a large oak I saw five Downy Woodpeckers rejoicing in the warm sunshine. As I wandered about through some leafless undergrowth, I flushed two Juncoes from the ground. They flew with a low, drooping flight to some bushes beyond, where they sat "chipping" softly together.

In a large expanse of swampy meadow and grassy field near Fresh Pond, I saw and heard many red-capped tree sparrows among the brush and weeds, which afforded both food and protection. This bird shows marked increase in numbers as spring approaches. Near the railroad track several Song Sparrows crept silently through the brush, where they had probably spent the winter. As I drew near them and they left the bushes, they flew low, with a characteristic pumping of the tail, to the nearest cover, as if loath to be seen. A grouse thundered up from a small weed mound where he had been sunning himself after his long, winter campaign, and after several powerful wing strokes, sailed over some small birches, and into the thick grass beyond. Suddenly, from a swampy thicket, the rather husky ditty of a Swamp Sparrow rang out its unmistakeable prophesy of coming spring.

Among the trees, bordering the ice encased brook in Rock Meadow, I saw numerous tracks of Bob White, winding in and out among the trunks of small trees, on the thin layer of snow covering the ice. Skunk cabbages lifted their odorous heads from a small brook lined with intensely green watercress, and as I approached an old stone wall nine or ten Juncoes flew from the bushes nearby and scattered like leaves to the ground some distance away.

The sun had completed its great journey across the heavens, and now sank slowly below the western hills, as I faced homeward after a day full of events and early spring signs.

The Blue Jay.

BY BERTIE M. PHILLIPS.

About a week before Christmas I observed a blue jay in a neighboring yard and thought how nice it would be if we could secure him and his mate for a daily visitor through the dreary winter. So, arming myself with a plentiful supply of crumbs, I crossed the road and under the tree where I first saw him I scattered a few crumbs and as I retraced my steps, dropped a few more and when I reached the window boxes of my own home I covered two of these with the remaining crumbs—as tempting a feast as any bird could wish.

I did not see any more of him that day, but the next morning he came to my window, very shy indeed, at first, just alighting for a morsel and then away to a neighboring tree, to devour it more leisurely. The next day another came and soon another and another till in less than a fortnight I had ten of those feathered beauties that breakfasted at my window every morning.

Then began, in earnest, my study of the blue jay. I had always been his friend and could not believe many of the scandalous stories told of him. First, I studied his tastes, and found him quite a epicure in his way. He cared but little for corn and oats and mush of any kind he would not touch but pieces of toasted bread and bits of fat were his especial dainties. One day I put on the boxes some scraps from leaf lard and suet with bits of toast. Two of the birds that morning took pieces of the bread, thrust them into the

fat until thoroughly covered and then flew away. In that way this pair took their breakfast.

My ten blue birds were blessed with good appetites and if given what they liked best would carry away a large amount in a short time. They were very fond of the trimmings of steak and other pieces of suet but lean meat was not to their fancies. They came for their daily meal about eight in the morning, and though they took occasional lunches during the day, they never called for food except in the morning. If their call of "Jay, Jay" did not bring their food promptly, some of the bolder ones would pick on the window panes with their bills, and stormy mornings they came some earlier and went away hastily. One pleasant day I noticed my flock in some trees near the house. It seemed to be a social gathering where each bird did something for amusement. Some were preening their feathers, others were hopping from branch to branch uttering their weird call, and others were busy picking something from the trees. I determined to find out what it was and so on examining the tree on which they were at work, I found eggs of the Tent Moth encircling the tender branches. One great point scored by my blue bird friend.

The birds were not nearly as pugnacious toward the English Sparrows or toward each other as I have seen many other birds appear. Soon after the middle of February I noticed different notes in his call and I found, too, when he uttered these, he moved up and down on the branch where he rested. It seemed as if the rising and falling helped him in the utterance of them. It is a call peculiar to himself and and not one he makes to mimic other birds. My birds were slender and graceful when first they came, but before winter had nearly gone, many had grown quite portly and assumed a kind of dignity peculiar to fleshy people. As the warm days of April came they returned less and less frequently, and at last, toward the middle of the

month, we thought our winter friends had flown. One morning the last of April I looked out and the ten beauties were scattered among the trees, calling to each other. Such a noisy concourse it was, but discordant as it appeared to be, we all enjoyed this farewell visit, as it proved to be.

It has been said that the jay lays her eggs in the nests of other birds, but this is not true as I have seen their nest and eggs. It is usually built in a tree crotch, fifteen or twenty feet from the ground. It is rather a rude structure built of twigs and strong roots but the lining of the nest is much finer than the outside. The nests I examined were in a scrub oak and cedar but we found another in a maple too high for inspection. The eggs, four to six in number, are pale olive gray, dotted with cinnamon brown. Both the male and female help each other in building the nest, and their family relations seem as happy as those of other birds, as far as I can see.

The jay is an insectivorous bird and also very fond of fine seeds, such as he finds in many noxious weeds, and while these food supplies can be found he will not visit the haunts of man. Thus he not only destroys many injurious insects but prevents the spread of numerous weeds. He is said to devour young birds and eggs, but statistics show that these are not his regular diet, for out of two hundred and eighty stomachs examined, only three showed traces of eggs and two of young birds.

I have found it impossible to attract jays to the house while their natural food supply can be obtained. When deep snows lie upon the ground they are driven to seek elsewhere, and then will take any kind of food gratefully.

Gulls and Terns of New England. III.

BY W. R. VARICK, M. D.

The Least Tern, (*Sterna antillarum*), is the last and rarest, as well as the least member of the family who nests in New England, and we must go south of Cape Cod to find him at all. He is only nine inches long, and reminds one of a big, white mosquito as he flutters over the marshes and ponds, his sharp little bill pointed straight down, and his keen eye on the lookout for game. Fortunately he is not addicted to mosquito melodies. In addition to the usual black crown, he has black lores and a white forehead. His upper parts are dark pearl gray, looking almost blue. and a narrow border of black edges his wings. His range includes suitable localities, inland, all over the United States, and he is common on the California coast; but the day will always be remembered by the Yankee bird lover, when this little beauty first skims across his visual field. He will hover over a marsh and circle around a patch of sea-weed for a few minutes, and pose with the greatest grace, till one begins to note his markings for identification, when, with a few strong wing beats, he is gone. I have only found him on the deserted ponds and beaches of the south shore of Martha's Vineyard where he breeds.

There are two large terns about twenty inches long that are rare stragglers here, the Caspian, (*Sterna caspia*), and the Royal, (*Sterna maxima*). They can scarcely be told apart in life, though the former is chiefly a bird of the interior while the latter is a coast resident of our Gulf and South Atlantic States. They have large, thick, red bills, and black crowns extended to form a crest. In Florida in winter, the Royal Terns are among the birds one sees every day along the shore.

Finishing up this long list is a bird that so far has escaped me. The Black Tern, (*Hydrochelidon nigra surinamensis*), who is said to be, in some years, a rather common migrant on the coast in August and September. He is a little fellow, ten inches long, dressed in summer almost entirely in dark slate color. But he shows a very remarkable color change, for in winter the under parts become white and the back and wings pearl gray. He breeds from Kansas to Alaska, but at this season is not found near the Atlantic coast.

His originality is shown as much in diet as in dress, for fish is said to form no part of his bill of fare. Aquatic insects and dragon-flies are the favored articles, the latter being caught with great dexterity on the wing. Though nesting in swamps and on lake shores, this bird may often be found far from water, for his great powers of flight lead him to long excursions in pursuit of his food.

The gulls make up a class of birds whose use to man is very apparent. Before their numbers were so depleted along the coast by the demands of modish millinery, they formed the greatest factor in the solution of the garbage question in our great coast cities. They are everywhere, where water and food are to be found, of course in greatest numbers where there is the most food. So the Herring Gull, being less shy than the others, took possession of our harbors and the contract to keep them clean, at least in winter. I have heard of a flock of hundreds of them escorting a tow of garbage scows down New York harbor, waiting for a feast when the dumping ground should be reached. Anyone who goes to the popular beaches in summer cannot help thinking that the gulls should stay the year round, their duties are not well looked after in their absence. After a wind has been blowing from seaward, refuse of all kinds is cast upon the shore. Everything that he can digest is food for the gull, and if the article is at all quest-

ionable, he eats it to settle the matter in the quickest way. If too tough for him, no harm is done, for indigestible substances are thrown up in the form of pellets, as is the case with owls. A gull's appetite is large, but as long as food is sufficient in quantity, quality is of minor consideration.

He catches fish when he can, although not a good diver. If the fish he catches has been dead some time, it is not wasted. All gulls are robbers, preferring of course, to rob smaller gulls and other birds, but if this is not possible, they cheerfully rob each other.

When he finds a savory morsel he must be prepared to swallow it whole, or share it with all his fellows who can get a grip on it. So wild chases and hurried dashes are the rule, and strong language is used, suitable to the occasion, intimidating cries and protesting shrieks. At low tide they seek the beaches and flats, for clams and scallops and small crabs. The clams are often carried up into the air and dropped onto the rocks to break the shell. Then, toward mid-day, when most birds rest, the gulls gather on the sand beach in flocks, and perform their toilet or lazily wait for hunger to start them off again.

These flocks are difficult to approach. The crowd has no more courage than the shyest member. One gull quietly concludes to move, the next instant the air is full of them and in two minutes all have vanished but a few innocently fishing in the distance. They are equally at home on the water, resting or swimming like large white ducks, or sleeping with head under wing. Usually they go to sea at night and sleep on the waves, except when looking after their eggs or young on the breeding grounds.

One of the greatest pleasures of a tiresome ocean voyage is watching the motions of the ever attending flock of gulls. On each side and behind the ship they fly, keeping an eye open for scraps from the galley, and making wild, headlong dives into the water, when any are thrown overboard. The

whole flock will discuss the matter till they are left far behind, but a few powerful wing strokes brings them back to their posts again. A twenty knot steamer going against a gale has not speed enough to make them move their wings; they soar along, rising and falling without any perceptible motion of a feather, for what seems hours, if one watches them.

There is a reason to believe that birds living along the coast or inland restrict their wanderings to a much smaller territory than one might expect. They have a favorite residence in winter as well as in summer, and the birds seen in the Charles River, for example, are, in many instances, the same individals who have wintered there for many years. On the other hand there are numerous nomads who have the whole North Atlantic for their range. Reliable sea-captains have affirmed that the same birds accompanied their ships from port to port across the ocean. This would seem to be doubtful, and a difficult matter to prove, and yet in gulls as well as in other birds there are occasionally anomalies which may make a certain bird recognizable.

One famous herring gull that had a blemish of this sort, figured in the Auk for several years. He was called Gull Dick. He cruised in the vicinity of Brenton's Reef Light ship, off Narragansett Bay, becoming very tame and familiar with the crew. At day break he would appear and wait patiently for his breakfast, which was always thrown overboard for him. He remained in the neighborhood all day. If he was invisible at dinner time, a whistle or call would bring him. But just as the lanterns were hoisted for the night, he would start off toward the mainland, for his chosen bed room. Interlopers were told by him plainly, that they must get out or fight, but his right to the place seemed to be unquestioned, he was rarely disturbed.

In 1891 he had been there regularly for twenty-one years. On October 7th, 1893 he came again, and remained until

April 5th. October 2nd, '94 brought him again, this time without a tail, his season closing April 6th. On October 2nd, '96 he appeared for his twenty-fourth and last season in full, beautiful plumage, and on April 2nd, 1896 he said "Farewell," never more to return. It is interesting to note the dates of his arrival and departure, year after year, as testifying to the exact regularity of the migratory movement. On several successive years he appeared on the same date, and on four successive years his departure took place on April 7th , 5th, 6th and 7th.

A Fast Day Pilgrimage.

BY FREDERICK W. BATCHELDER.

When that Aprille with his showres swoote
The drought of March had perced to the roote—

(After Chaucer)

That is to say, on the 17th of April, 1902, "four solitary pedestrians" (after G. P. R. James) might have been seen, provided any one had thought them worth looking at, wending their way toward Goffstown hills and the secret shrine of St. Viola. They were armed with tin boxes and field glasses and note-books and various other paraphernalia of scientific investigation, not omitting the very essential adjunct of lunch. It may as well be stated at the outset that two of the four were ornithologists and two botanists. This is a perilous combination in most circumstances. When it occurs in the same person the result is bad enough. If his eyes are set at the ornithological angle, a trifle above the horizontal, the botanist misses his aim. If they are set at a botanical angle, which is usually about thirty degrees below the horizontal, the ornithologist is similarly baffled. With a party the outcome is simply disastrous, at any rate to the botanists. The ornithological side of the scale goes down with a bang the mo-

ment a bird appears. But the particular combination on this occasion was an ideal one, two against two and each pair dead set on their own loves. There is magic in the number four. As for pairs, you may make six of them, A and B, A and C, A and D, B and C, B and D, C and D; and you may make three sets of double pairs, A B against C D, A C against B D, and A D against B C. As a matter of fact, all these combinations were effected at times. When real work was to be done the original pairs came together at once, the bird-loving pair to chase over fence and pasture with field-glass, the plant-loving pair to ply jacknife and pocket lens.

Why is it that botanists are usually so lonesome? Why are birds so much more attractive to most people than plants? I suppose the reason must be that birds seem to have so much more life. This little brown creeper, poking his way up the great elm tree, and when he has got to the top dropping to the base again and resuming his endless journeyings, he is certainly an object of intense interest. We love to watch him, earning his living by patience and industry, and we admire the result of natural selection in his protective coloration. We can scarcely distinguish his little form from the elm bark, except when it happens to be projected against the green background of a lichen. In the field close by are yellow palm warblers, incessantly flirting their tails. High up in air, floating rather than flying, is a red-shouldered hawk. If he is hungry and wants to catch his dinner, why does he scream so and scare the little birds away?

Yes, the creeper and the warbler and the hawk are full of life. But so are the plants, the trees and the grasses and all the tribe of rooted things, feeding on earth and also clothing its nakedness with robes of beauty. Did you ever think what this world of ours would be without plants? It would be either a boundless desert or a boundless sea.

What makes the landscape? The mountains and plains and valleys are, so far as man is concerned, frames to hang vegetation on. Even on this early spring day, while most of the foliage is yet undeveloped, it is plants that give color to the picture. In the meadows and pastures the root leaves of the grasses are already vivid in hue; the grain-fields are yellow-brown with the stubble of last year's crop; the swamps glow with the scarlet flowers of the red maple, more brilliant on those trees on which the later maturing female blossoms predominate. Plants even give color to the brooks which are hurrying with all their might to carry off the surplus water from the woods and the lowlands. Even the stagnant pools have taken on a spring tint from the algæ and other water plants which have chosen them for a habitat. The evergreen trees heighten the picture with their sombre shades, and the round blue dome of the sky frames the whole.

The roads are somewhat dusty, and the four by and by turn into a field and strike out in the direction of a certain hill, whereon is hidden the shrine of St. Viola. The way has to be forced through thickets of bushes and brambles. The ground is thickly strewn with dried leaves. All at once an exclamation from one of the ladies—for we were two and two—"Did you ever see anything so beautiful!" And there, springing up through the brown mantle, were clumps of flowers in full bloom, in color varying from white through pink to light and dark rich purple and even to blue. This is the first and perhaps the most beautiful of our spring flowers, the liver-leaf, *Hepatica triloba*. The leaves are long petioled, have three rounded lobes, and some of them are of the peculiar hue which has given them their common name. The flowers are on slender scapes which are covered with white hairs. These hairs are sometimes so numerous and so white as to give the plant the aspect of having been sprinkled with powdered helle-

bore. For a short time A, B, C and D are all botanists. After the labor of collecting specimens is over, a sunny spot on the west side of a slope—the wind being east—is chosen and lunch is served to the music of the pines. The scent of the sweet fern is in the air, and for a second course we hunt these plants over for the little cylinders of female flowers with the exquisitely tinted purple stigmas projecting from the scales. It is rather early in the season for them, and careful search on more than a hundred plants yields only four specimens. There is a meadow to cross and a hill to climb before we can reach the shrine of St. Viola. So on we go, while the phœbes and the bluebirds and the woodpeckers and the nuthatches try to charm us back. Their efforts are in vain, and finally we come to the sacred spot. The rocky slope of the hill is clad with birches, maples and beeches. At the base is a wet, mossy run. All along this run and far up the hill are hepaticas in abundance, just coming into flower. One of the party strays away from the other three and seems to be looking theground over very closely. Perhaps he sometime lost his jacknife here. That is an accident which frequently happens to the like of him. A botanist needs to have his knife tied to him with a string. Presently he springs up, shouting, "Here she is, here she is, St. Viola!" And, to be sure, there she is, and all fall on their knees at her shrine! In fact, you have to get on your knees if you would come near her. Like Portia, she may say, "Now am I great because I am so small." A tiny glint of bright yellow—that is her blossom, not more than two inches above the dead leaves. Her own leaves are roundish, with crumpled edges, and not more than an inch long at present. The flowers, as they grow older, will turn pale yellow, and when they are gone the leaves will begin to enlarge until they are at least quadrupled in size, and, what is queerer still, they will hug the ground so closely that

some force will be required to detach them from it. The aspect of the plant in summer is so changed that a person unacquainted with it would not suspect it to be of the same species as that he saw in the spring.

We, the worshippers, are wondering what may be the meaning of this strange behavior and speculating as to what may be its significance in the schemes of evolution and natural selection, when our attention is arrested by a faint, far-away voice, like a telephonic message from the planet Mars. While we listen intently, the spirit of the whispers to us

THE LEGEND OF SAINT VIOLA.

"I was the favorite flower of the holy maid Viola, who, long, long ago, lived in a northern country. Every spring, when the sun began to melt the snow in the bare woods, the maid would come to seek me when first I peeped out from under the brown leaves, and when she had found me she would thank God for giving me beauty and for bestowing upon her the power of loving Him and all the beautiful things he had made. Now Viola had devoted herself to the service of Christ, and had faith that she could complete the conversion of her people to His religion, for the king and nobles were worshippers of the old gods. And first of all she desired to found a monastery. But she was of humble origin and possessed no land. So she besought the king for a tract of land suited to her purpose. Then the king laughed her to scorn, saying, 'You shall have just so much land as you can cover with your silken mantle, and no more;" meaning thereby only enough in which to dig her grave. Then the maid prayed to God for help; and when she had done praying she cast her mantle upon the ground. Then the king's servants, with jest and taunt, began to spread it out, when, lo! fold after fold opened until rood on rood of ground was covered with the

silken sheen. The king and nobles looked on in terrified amazement; and when at last the mantle was fully outspread they fell on their knees, exclaiming, 'A miracle! a miracle! Truly, the maiden's god is greater than our gods, and henceforth we will worship none but him.'' So all the people from that day forsook their idols and served the One God and His Christ, and the holy maid Viola became the first abbess of the monastery and lived to rule it many years.

It is in token of this miracle that my leaves keep on growing and growing until they cover all the ground about me.''

Perhaps not a very scientific explanation of the habit of *Viola rotundifolia*, the early yellow violet; but it may answer until we find a better one! And the pilgrims, resolving themselves into their original combination, wend their way homeward, better and happier, if not wiser, for the whispered legend of Saint Viola.

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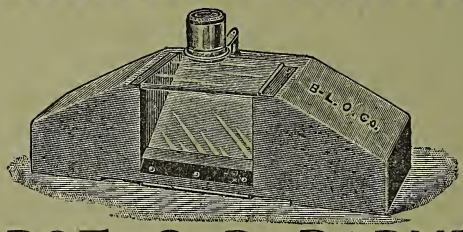

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